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Quantitative Corporate Finance

Springer

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ISBN-13: 978-1-4020-7019-8 e-ISBN-13: 978-0-387-34465-2

Library of Congress Control Number: 2007929318

Printed on acid-free paper.

9 8 7 6 5 4 3 2 1

springer.com

ACKNOWLEDGMENTS

The authors would like to thank their wives, Renee Schwartz and Julie Guerard, for their support while this project was being completed. Additionally, we thank people who took the time to read and comment on the chapters. Mr. Dan Deeney read the entire manuscript and provided many helpful corrections and suggestions. Professors James Vander Weide, of Duke University, and Bernell Stone, of Brigham Young University, were among our manuscript reviewers and read several chapters. Dr. Harry Markowitz and Professor Tao Wang, of Queens College, read the portfolio risk and return on equity and multi factor risk model chapters. Professor Ralph Steuer, of the University of Georgia, commented extensively on the forecasting and time series chapters. Professor Steve Buell, a former colleague at Lehigh University, read several chapters. We thank these gentlemen for their time and thoughts. Mrs. Alex Slivka and Sundaram Chettiappan of McKinley Capital Management read several chapters and provided very useful comments. Any errors remaining are the sole responsibility of the authors.

The manuscript was written (99.5%) while John Guerard taught Advanced Corporate Finance in The Graduate School of Management at Rutgers University, the University of Pennsylvania Executive Masters in Technology Management (EMTM), and the International University of Monaco (IUM). I thank my students who corrected typographical errors. We covered the entire manuscript in a four-day session (8 AM – 6 PM) in Monaco, adjourning to Stars 'N Bars for refreshments after class. John Blin and Steve Bender, of APT, provided their software for classroom use at Rutgers and IUM. The APT software is used in the multi factor risk model chapter. John Guerard has published with Mr. Blin and Mr. Bender and is grateful for their friendship and support. The APT software enhances student knowledge of practical multi factor risk models.

Rene Hollinger, of Lehigh University, typed and prepared the manuscript and we are indebted to her able assistance.

CONTENTS

Chapter 1

INTRODUCTION: CAPITAL FORMATION, RISK, AND THE CORPORATION

The corporation is the major institution for private capital formation in our economy. The corporate firm acquires funds from many different sources to purchase or hire economic resources, which are then used to produce marketable goods and services. Investors in the corporation expect to be rewarded for the use of their funds; they also take losses if the investment does not succeed. The study of corporation finance deals with the legal arrangement of the corporation (i.e., its structure as an economic institution), the instruments and institutions through which capital can be raised, the management of the flow of funds through the individual firm, and the methods of dividing the risks and returns among the various contributors of funds. The goal of corporate management is to maximize stockholder wealth. A major societal function of the firm is to accumulate capital, provide productive employment, and distribute wealth. The firm distributes wealth by compensating labor, paying interest on loans, purchasing goods and services, and accumulates capital by making investments in real productive facilities.

1. FINANCIAL MATHEMATICS AND THEORY

The financial market is basically free of the frictions of imperfect competition. Securities of a given class and grade are largely homogenous, and the traders and investors do not have strong label or brand preferences. Because the markets are large and have a long history, there is a large mass of data that can be evaluated. This means that financial theory and derived mathematical models may be better evaluated, more appropriate, and better applied than elsewhere in the continuum of business and economic studies. We make extensive use of data in this text, using the data found on the Personal Finance directory of America On Line (AOL), Standard & Poor’s (S&P) *Stock Guide*, Wharton Research Data Services (WRDS) Compustat, Global Compustat, IBES, and Center for Research in Security Prices (CRSP) databases. These databases are well known and respected sources of financial data. The investor or financial researcher can find five years of data on AOL, 10 years of data in the S&P *Stock Guide*, 20 years of income statement and balance sheet data on an industrial Compustat database, and data for the 1950-2003 period with the WRDS Compustat data facilitates. We specifically selected Dominion Resources, DuPont, IBM, as firms to study with respect to their respective financial statements, ratios, valuation, and the cost of capital. These three firms are large, respected firms in their industries, and are familiar to many readers of this text. The reader is introduced to regression and time series analysis to facilitate quantitative analysis, such as estimating betas, or measures of market risk, forecasting earnings per share, predicting stock rankings, analyzing the predictive power of the leading economic indicators.

2. GROWTH AND SURVIVAL OF THE FIRM

Finance focuses on the flow of values through the firm. Corporate finance is concerned with how the firm produces goods and services, generates cash flow, and generates returns for its investors. It explores the effects that different levels of the flow of values over time will have upon the complex legal and accounting entities making up the firm. It is interested in the relations between the legal owners and the various classes of creditors, and it explores the circumstances under which the claims of the original owners can grow and survive and be augmented, or, in contrast, those circumstances under which the legal claims of the owners must be forfeited to the claims of the creditors.

3. RISK AND UNCERTAINTY INHERENT IN FINANCE

The financial management has the tasks of minimizing the total cost of financial funds to the firm, providing adequate resources for expansion at a cost low enough to make it profitable at a risk low enough to maximize the firm's chance of survival and its stock price. Sometimes the problem of providing adequate funds at minimum financial costs can be separated from the problem of survival or risk and be dealt with simply as a problem in costing or economics. Where this is possible, however, it is usually because some earlier decision set the bounds of the problem. An earlier decision assumed the risks, and historically assumed risks can no more be discarded than historically assumed sunk costs.

Whatever the initial approach, the heart of financial theory is the problem of risk and risk-bearing.[1] The flow of values generated by an initial commitment of productive resources cannot be exactly predicted. Risk is always two-sided. Asset prices may be better or lower than the original value of the assets invested. If the long-run flow of values is larger than estimated, the value of the owners' original investment is augmented; if, on the other hand, the flow of values falls below the original estimate, the owners will have to accept a lower valuation or a forfeiture of their claims. Should the stream of income fall low enough, even the creditors, depending on their legal position and status as risk-bearers, might have to accept some of the losses. One of the goals of this text is to acquaint the reader with the tools necessary to quantify risk and return.

The financial student must always grapple with the problem of uncertainty. The financial results of any single productive attempt are never sure. There is risk not only when a new enterprise is launched, but also for established firms as long as uncertainty exists continually and concurrently with the productive cycle.

4. TYPES OF BUSINESS RISK

All other things equal, the element of risk intensifies the longer the production cycle. Risk varies directly with the length of time required from the first application of resources to the final appearance of the product. One type of time risk is of natural or physical origin. It includes fire, theft, flood, drought, and machinery breakdown. These risks can sometimes be insured against, if the probabilities of their recurrence are known, if they are independent events, and if society is sufficiently well organized to have set up the insurance mechanism. But the full losses entailed by these events are often uninsurable, for though the value of the physical assets may be recovered, lost time in production or sales may not be. Furthermore, a company may suffer a loss through disasters to other firms it relies on as suppliers or customers. Insurance companies may not write regular policies against certain hazards (such as flood) or the insurance costs may be prohibitive.

Another type of time risk involves unexpected political or economic changes. A recession may occur, government policies may change, a rival product appears, or tastes may change before the process of recovering the investment is completed. This type of risk is double-edged; there is always the possibility that conditions may change in a favorable direction and lead to a greater return than anticipated.

There is greater chance of the economy veering over a longer time span. Any productive organization utilizes many factors to which its commitment varies in length of time, and the risks to the firm depend partly upon the composition of these productive resources. Some resources, such as labor, may perhaps be withdrawn quickly; fixed plant or machinery, however, may have to be used for a long period before their value can be recovered. The complete production cycle for different resources (assets) varies, and for the firm, the composition of the resources it uses entails different degrees of risk.

Another risk is that the original estimate of demand or costs may be wrong. The possibility of error in either the forecast or in the original estimate of the economy as it currently exists can be minimized by competent research before production is launched. But error can only be minimized, never eliminated. Moreover, research is not costless; the outlay for research and its value in the reduction of hazards must be weighed against all the other possible outlays and their probable returns. The operational model involves comparing the marginal cost of additional research to the marginal value of the additional risk allayed. The optimum point is reached when the marginal cost of additional research equals the marginal value of the additional risk averted.

The costs of investigation are the reason many beginning small businesses make perfunctory estimates or forecasts. The small businessman cannot spend let us say, $20,000 to investigate the potential of an enterprise for which he has only $20,000 to invest. The initial estimate on returns and costs behind the launching of many small enterprises is likely to exist largely in the head of its founder.[2]

Another class of risks is called exploratory or technical risks. The exploration for mineral deposits is a risky enterprise; one can never be certain that the mineral will be found – or found in amounts sufficient to justify commercial exploitation. Similarly, a new product or a new method of production always involves uncertainty, for no one can be sure exactly how the innovation will behave when put into the commercial production. No matter what precautions are taken, the characteristics of a product in the test tube or pilot plant often change unaccountably when the item is produced commercially. Neither the mine operators nor the innovators can be sure of the economic feasibility of their activity until production is launched.[3]

5. FINANCIAL RISK

We pay particular attention to financial risk in this text. Stockholder returns have been subject to larger variability than bond returns during the 1926-2003 period. One must discern between systematic risk, the risk of the market that cannot be diversified away, and total risk, as measured by the variance of stockholder returns. We estimate the stock beta, or measure of systematic risk, and illustrate how securities can be combined into portfolios to minimize portfolio risk to stockholders. Management calculates the firm's cost of issuing equity, and its cost of capital. The cost of capital is the minimum acceptable rate of return for projects to be acceptable to enhance stockholder wealth. Management must decide whether the expansion of the firm is financed by using reinvesting corporate profits, or by issuing debt or new shares of stock. The debt or equity decision should be made such that the firm's earnings per shares (eps) is maximized.

6. DIVISION OF RISK, INCOME, AND CONTROL

Although risks and uncertainties are inherent in every business enterprise, different class of investors in the firm do not shoulder the same degree of risk. The investor earns returns from bonds and stocks, and incurs risk in the form of uncertainty of those returns. An investor in bonds earns returns from interest paid on the debt and possible bond price appreciation. The stock investor earns a return dependent upon the dividends paid on the shares of equity and the stock price appreciation. The interest paid on bonds is determined by the coupon rate of the bond, whereas dividends are paid from the earnings of the corporation. Firms may experience losses for several years and not pay dividends. Moreover, the firm's stock price may decline, as we saw from 2000 to 2003, such that total returns may be negative. Traditionally, the total return on stocks over time has exceeded the return on bonds, but with a much greater variability of returns.

Modern finance has created different formal legal (or accounting) relationships which distinguish different classes of investors contributing to the funds of the business organization; the intensity of risk which each investor class bears varies considerably. The legal classifications on the liability and capital side of the balance sheet represent a division of risk. For example, the element of risk is less for current creditors. They advance funds for only a few weeks or months. The possibility of deterioration in the credit position of the borrower is limited because of the short term maturity of the loan. A trade creditor or banker making a short-term advance of credit funds usually looks to the flow of cash from current operations or from the liquidation of receivables or inventory to provide the repayment to the firm.

Because of his minimal risk position the short-term creditor generally offers funds at a low cost.

Moreover, because the risks are relatively short in duration, the supplier of current funds generally does not seek a voice in shaping company policies. Since the advance is temporary, the short-term creditor can do little, in any case, to enhance the probabilities of repayment at maturity. (Occasionally, however, if a firm is slow in meeting its current obligations, the trade creditors may combine in an informal committee to set terms of extended payment and to establish an operating framework for the firm until it is once more current.)

Usually, a distinction through superiority of claim and restrictive covenants is made between the long-term debt (bonds, funded debt, etc.) and the current liabilities. These distinctions are not inherent in the original legal-accounting position of the long-term creditor. At the start, a long-term creditor would have no more control over the policies of the firm than the current creditors, and in case of actual insolvency, the longer-term creditors do not initially receive a position superior to short-term creditors. In a failure, all general creditors share the option to collect from the general assets equally. Therefore, since uncertainty usually increases as the time period increases, the long term creditors, committed to the enterprise for a considerable period, would be at an essential disadvantage. In the case of default, long term creditors would have only an equal claim shared with the current creditors to the assets. The time risk could be so great that a mere priority of claim to the general assets against the owners, but not against the short-term creditors, would not be sufficient to induce creditors to lend at long-term without a wide differential in interest charges. If the long-term creditors were to invest funds on a basis of equality with the short-term lender, they might require so high a rate of interest that the earnings left to the owners would not be sufficient to induce them to take the remaining risk. This dilemma is solved by granting the long-term lender certain distinct advantages. In the original debt contract the long-term creditors may be promised that certain financial policies will be followed; in this sense, the long-term creditors are given a limited amount of control over the financial policy of the firm. The long-term creditors may be granted a prior claim over other creditors to specific assets plus an additional undifferentiated claim against the general assets if the value of the pledged asset should prove inadequate. These concessions, coupled with a prior but limited claim to earnings, lower the risk to the long-term lender to the point where he is willing to lend at a usable price. The bondholders have a prior claim on assets relative to stockholders in failure.

The contractual right to a prior claim on earnings is the most important part of the guarantee to the long-term creditors. They are to be paid the contractual interest even though the total flow of earnings does not justify the original cost of the total assets (productive factors) dedicated to the enterprise. The lien against assets is a secondary guarantee or option which comes into play only if the cash flow is insufficient to cover the contracted interest rate and the repayment of principal. The option to acquire the assets is nowhere a full guarantee against loss. The assets of a failing firm would bring full value only if they could be transferred to another enterprise or use where their expected earnings will be higher than that in the present firm. This is not a likely occurrence; nevertheless, the right to seize essential assets gives the long-term creditors a strong bargaining position in the event of a reorganization of the existing failed firm. In most instances, a lien or option against the assets provides a reinforcement of the claim against earnings (or cash flow) and not a guarantee against, only some hope of a limitation to losses.

Since no change in the formal accounting relationships can change the totality of risk or uncertainty, the privileged position of some financial contributors, creditors or preferred shareholders, can only heighten the risk of the other investors or shareholders. In financial practice, the most unsheltered position belongs to the residual owners (the shareholders), for they contract to use outside funds, and they negotiate the terms under which the risks of the various creditors or preferred shareholders are reduced.[4] The owners' investment serves as a buffer to protect the contributions of the various creditors. There is no pro rata sharing of losses; if the business experiences an operational loss, the owners bear it. Should losses keep recurring, however, and the firm fail, the owners' investment may be wiped out, and bankruptcy may result. Only then, with the owners' equity completely dissipated, would the creditors suffer financial losses. Logically, then, the bearers of the greatest risks, the owners, are also given the ultimate control of the enterprise. The brunt of the loss resulting from an erroneous decision must be borne first by the initial risk-bearers, the owners or common stockholders; they cannot create losses for the other contributors without bringing a fair measure of ruin to themselves. The owners of a firm can be expected to behave rationally and, in protecting their position, shield the creditors from inordinate hazards.[5] In compensation for taking the most exposed risk position, the owners receive the best return if the operations are profitable.

Because it is accounting that classifies the amounts in the various legal and formal risk categories, the student of finance must have some acquaintance with operational accounting. The study of corporate finance draws upon both economics and accounting. Accounting provides the data needed to depict the relations of the capital and liability side of the balance sheet (the financial structure of the firm); it also provides the data necessary to derive the cash flow – the gradual conversion of assets to cash and back again.

7. PROFITABILITY RETURN, AND RISK

Risk and uncertainty pervade the field of finance. Assuming stockholder wealth maximization as a first approximation of the producer's goal, and developing marginal analysis as a tool, economics can provide useful insights into the organization of society and business decision-making. However, the typical financial decision is made under varying degrees of uncertainty, and the problem is to change these uncertainties, as far as possible, into objective probabilities, and arrive at the proper charge or premium for risk.[6] Uncertainty is moved toward more stable probability only as more and more individual but similar events are averaged together. This means that financial decision-making tends to deal in averages and probabilities.

In practice, financial decisions are basically choices between potential return and risk. Consider the structure of the firm's asset holdings. The greater the liquidity of the assets, the less is the risk of loss. The larger the percentage of assets the firm borrows, the greater is the risk of loss. A greater use of borrowed funds may raise the net return to the owners, but only at the cost of increasing the uncertainty of the firm's survival. The problem of the composition of asset holdings is characteristically posed as liquidity vs. earnings. The problem of choosing sources of funds is a question of maximizing earnings per share and the stock price. The choice between a conservative financial structure and an aggressive financial structure influences returns to the common shareholders.

The most rational choice is not necessarily in favor of minimum risk. An extremely stable enterprise, which shows a minimum rate of return, may not be as valuable as one, which earned at a high rate for some years even if eventually its assets should dwindle or be dissipated through losses. The most stable firm would hold no assets but cash and it would have a capital structure of all common stock. It would also show no profit.

8. AREAS COVERED IN THIS BOOK

We conceive of the corporation as the major institution for capital formation in our economy. It is also a method for formalizing the division of risk bearing, control, and income among the various contributors of funds.

The book develops the legal and organizational framework of the corporation from a functional point of view. The discussion of the major accounting statements provides an understanding of the source of financial data. A description and analysis of the capital markets and the instruments of long-term financing follow. Throughout we are interested in setting up the interplay of risk, control, and the cost of funds.

Although policy considerations (both internal and external) are introduced early, their discussion' dominates the last half of the book. The authors explore the factors governing the choice between return and risk in the various areas of financial decision-making, and discuss the area of choice in the deployment investment in working assets and the retention of funds for emergencies or improved opportunities. The text deals with the analysis of expansion programs, analyzing their effect on cash flow, in the determination of whether the resultant risk is justified by the projected return. It should explore the models depicting the optimum capital structure, i.e.; the composition of borrowed and equity funds, which would maximize the value of the ownership shares. Lastly, the authors discuss the circumstances under which a firm would be disbanded, liquidated or reorganized.

The text deals with the corporation as a social and economic institution. It covers the effects of the corporation operations on the economy: capital formation, economic stability and growth. It deals with the problem of the evolving relations between management, stockholders, and society. Lastly, the text carries a discussion of the different views of the effects of the large corporation in a competitive economy.

Notes

[1] Risk is used here in its broader sense to include the problems of uncertainty and not in its more precise definition, where it includes only those phenomena whose probabilities are reasonably known and which therefore can be insured against.

[2] Even where resources may be more abundant the costs of testing or obtaining statistics should be weighed against the degree of certainty likely to be obtained. This concept as first elaborated by Abraham Wald, e.g., "Basic Ideas of a General Theory of Statistical Decision

Rules," Proceedings of the International Congress of Mathematicians, Vol. I, 1950, has led to the development of sequential analysis and sampling techniques.

[3] This differs in degree from the error or risk in forecasting demand. In this case, it is the characteristics of the production function that are uncertain.

[4] Although risk, income, and control can be divided in almost any manner in the various stages of single proprietorship, general partnership, and limited partnerships, combined with various short-run creditors, mortgage holders, and term loans, the corporation formalizes and illustrates these relationships better than the other business organizations. For this reason most discussion of financial structure uses examples from the corporate form. The flexibility of the corporation as a financing device is practically unlimited.

[5] The owners' position of control and greatest risk might be compared to a captain of a ship. In case disaster forces abandoning the vessel, the captain is traditionally the last person overboard. This tradition probably evolved as a result of the captain's control over operations, for the vulnerability of his position (the greatest risk-taker) ensures that he will direct the ship in the most responsible manner unless, of course, he is irrationally bent on self-destruction.

[6] Economic theorists allow for risk as a cost. But the problem is more often recognized than discussed.

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Chapter 2

THE CORPORATION AND OTHER FORMS OF BUSINESS ORGANIZATION

In 2000 there were somewhat more than 25 million nonfarm business firms in the United States. About 5.045 million of these were corporations of all classes; the other 2.058 million were partnerships; and 17.805 million were nonfarm proprietorships. A very few may have been trusts or one of the other rare forms of business organization.[1] Although the corporation is not the most numerous form of business organization, by far the greatest economic activity is carried on under the auspices of the corporate form. As Table 1 shows, some 66 percent of the gross national product originating in the business sector flows through the corporate sector.[2] The corporate form of business organization is dominant on the American economic scene.

Table 1. National Income for 2000, Originating in the Business Sector (in billions of dollars)

Legal Form of Organization	Amount	Percent of Total
Corporations	$ 928	65.7
Partnerships	269	19.1
Nonfarm Proprietorships	215	15.2
	$1,412	1.000

Source: U.S. Department of Commerce, U.S. Census Bureau, *Statistical Abstract of the United States*, 2003, p. 495.

The overriding advantage of the corporation, the limited liability of the shareholder, has made it the dominant form of business enterprise in the world in economic terms. The corporate form has the ability to amass capital from many sources and put it to productive use. Much of this book is concerned with the complex relationships and the nexus of institutions through which firms (corporations) can raise funds to finance growth and operations. The reader is reminded that management seeks to maximize stockholder wealth in its financial decisions. This chapter is mainly concerned with the institutional and legal arrangements that have enabled the corporation to be more effective than other forms of business organization in performing this function on a large scale. Accordingly, the next section of this chapter contains a comparison of the major forms of business firms. We will examine the legal formality of organization, the personal liability of the owners, the responsibility for management, and the tax status of the major business forms.

Table 2. Number of Returns and Business Receipts, 2000

	Returns (1000s)	Business Receipts ($ Billions)
Corporations		
Under $25,000	5045	4
$500,000-$999,999	582	407
> $1,000,000	946	18,738
Partnerships		
Under $25,0000	1,105	5
$500,000-$999,999	82	86
> $1,000,000	137	2,143
Nonfarm Proprietorships		
Under $25,000	11,997	80
$500,000-$999,000	190	123
> $1,000,000	92	227

Source: U.S. Department of Commerce, U.S. Census Bureau, *Statistical Abstract of the United States*, 2003, p. 495.

1. THE SOLE OR SINGLE PROPRIETORSHIP

The greatest numbers of firms are single proprietorships. The organization of the single proprietorship involves little legal formality. The owner and the business firm he owns are legally one. No special legal permission is required by the state to set up a sole proprietorship.[3] The proprietor has legal title to the assets of his business; she or he personally also assumes all debts. If in the course of operations, the assets of the business fail to satisfy all of the business liabilities, a proprietor's personal wealth or holdings may be used to help cover the claims of business creditors. Moreover conversely, the net business assets are subject to the unfulfilled claims of personal creditors. This constitutes the basic rule of "unlimited liability for all debts whether personal or business." This rule actually strengthens the relative credit position of the single proprietor because the proprietor's personal wealth acts as a sort of second guarantee for the safety of the business debts; it also is the major drawback of this business form, because a failing venture may cost an individual not only the funds directly risked in the business, but the rest of the moneys, assets, or wealth he may have reserved for personal use.[4]

The single proprietor is responsible for running and managing his own business, but he may hire managers and agents as he sees fit. The single proprietor is taxed at the applicable individual income tax rate for all the net income arising from to his business. After making proper arrangements with his creditors, the owner may dissolve his business any time he desires.

The single proprietorship has the advantages of simplicity; flexibility, and direct responsibility in management. It is limited, however, in its sources of ownership capital (i.e., risk capital) and in its ability to attract specialized managerial talent.

2. THE PARTNERSHIP

A partnership is an agreement by two or more individuals to own and run a business jointly. The agreement can be oral, but in most cases it is in writing, to prevent possible subsequent disputes. In some instances it has even been created (constructed) by the courts where individuals have so acted as to lead others to believe that a partnership existed. The usual clauses in a written agreement are fairly well standardized.

Forming a partnership does not require any specific permission from the state. If the partners wish, however, they are generally entitled to file a copy of the agreement at the court house, which thus serves as a reliable neutral depository.

Each partner may bind the others to contracts incurred in the normal operations of the business.[5] Thus the partnership has often been defined as a contract of mutual agency. The legal profession repeatedly advises that one should have confidence in the reliability and judgment of the other party before entering a partnership.

The ordinary partner (strictly defined as a general partner unless the general partner is an LLC, a limited liability corporation) has unlimited liability for the partnership's business debts.[6] Thus if the partnership fails and the firm's assets fail to cover its liabilities, the creditors may seek to recoup their losses from the partners' private assets. Moreover, it is not the duty of the creditors to apportion losses among the partners. They may seek compensation for their claims where they can find it, regardless of any loss-sharing agreement among the partners. If one partner's personal assets are greater, or simply more available, he may well suffer disproportionate losses. A partner who loses more than his agreed share may have a counterclaim against the other partners,[7] but, of course, collection under these circumstances may be delayed considerably.

It is generally held that a rich man should be careful about entering a risky venture in partnership with a poorer individual. On the other hand, although their unlimited liability entails some financial dangers to the partners, it gives the partnership a stronger credit base than would a corporation of the same size.

No matter what formula has been set up for sharing returns out of the company, each partner will be taxed at the appropriate individual income tax rate for all the income realized or imputed to him out of the operations of the firm. Thus, if a partner receives a salary for his services to the partnership, interest on loans to the partnership, and a share of the remaining pro forma profits,[8] he will pay tax on all of these items. He must pay tax on his total share of partnership profits, whether he draws them out for personal use or reinvests them in the business. The partnership as a firm files a Form 1065Information return and distributes K-1s to the partners. Its report is made purely for information purposes, in order that 100 percent of the partnership income can be imputed to the various partners.

However, provision of the federal income tax laws allows a partnership that satisfies certain conditions to elect to be taxed as if it were a corporation. In this case, retained earnings may (for the time) bear a lower rate of tax than the applicable personal tax bracket of the partners.

Because the partnership rests on a foundation of mutual trust, its dissolution is made very easy. If no specific provision is written into the agreement, any partner can call for dissolution, usually with a required notice of, say, 30 days. Then a procedure called an “accounting” takes place; the assets are liquidated and each partner is paid his ownership share (equity) according to the agreement. Since the assets upon liquidation are unlikely to bring in their “going concern” value, dissolution usually entails an economic loss. Often the partnership agreement sets a definite liquidation amount to be paid to a partner who requests dissolution, so that the whole going-concern need not be liquidated.

Since the partnership is a contract of close personal relationship, a partner’s interest in the firm cannot be easily transferred or sold to a third party although the partner’s interest can be assigned on death. A new party cannot enter the partnership without the consent of all the partners. If with the consent of the other partners, one partner sells out his interest in favor of someone else, the old partnership is actually legally dissolved, and a new firm is formed.

Again, since the partnership is constructed on the basis of personal contracts, the death of any partner dissolves the relationship. The heir of the deceased partner does not automatically become a member of the firm. If the surviving partners wish, they may let him in, actually forming a new partnership. Otherwise, the heir is entitled to a dissolution and accounting. It is quite usual, however, for the payment to the heir to be pre-set in the partnership agreement. The difficulties that may occur because of the death of a partner give a partnership an insurable interest in the life of its principals. The insurance benefits may help in settling the partnership accounts.

The main advantages of the partnership form of business firm are flexibility in operation and ease of organization. More managerial talent can be assembled than is possible under the single proprietorship. The partnership can bring together more capital than is likely in the single proprietorship, and it may have a better credit standing relative to that of a small corporation because of the unlimited liability of the partners.

On the other hand, the partnership may engender tensions between its principals. It may be unwieldy to operate if there are too many general partners, since each partner is a general agent of the firm. This factor, together with the unlimited personal liability of the partners, tends to limit the total capital that can be raised. Because a partner may risk his personal fortune on the activities of the partnership, he generally wants a hand in the partnership affairs. To the drawbacks of the partnership form must be added the difficulties of selling a partnership interest and the possible losses from a forced dissolution caused by either the death or withdrawal of one of the partners.

Nevertheless, the partnership has proved serviceable where the total capital needs of the firm are not extremely large. The partnership is very common in smaller companies in the marketing field, in small manufacturing firms, in the professions, and in agriculture. The partnership form is very suitable where the personal skills and reliability of the partners is more important than capital in engendering income for the firm. (Thus doctors, lawyers, accountants, etc., have often been quite successful practicing as partners.) In the past, in those areas of financial activity where the bulk of the assets are carried in a liquid or highly marketable form and the problems of dissolution are not difficult (such as investment banking or security brokerage), the partnership was quite common.

3. THE LIMITED PARTNERSHIP

Given the versatility and imagination, with which persons direct business affairs and the ingenuity of the legal profession, it follows that there are many forms of business organization. Some of them are not very common today and are mainly of historical interest. The limited partnership, however, is an interesting and. fairly common variant of the partnership form.

A limited partnership contains one or more general partners; one or more partners who are limited in their liability for business debts to the amount of their investment in the firm. The general partner or partners manage the firm, and are subject to unlimited personal liability for the firm's debt. The limited partner, of course, receives some agreed-upon share of the profits. Sometimes called the "silent" or "sleeping partner," he cannot take an overt part in running the business, for if he does and the creditors come to believe he is an active partner, he may lose his limited status in the eyes of the law.

If a general partner wishes to retire from active management and become a silent partner, all interested creditors must be notified. Thereafter the limited partner cannot present himself in any way that could lead an "innocent third party" to believe he is a general partner.

The limited partnership is not widely applicable. The silent partner must rely heavily on the acumen and integrity of the general partners. He should, of course, keep himself informed of the progress of the business. If he is not satisfied with performance of the enterprise; that is, the treatment he receives or the results achieved with his capital, his sole legal course of action would be to ask for dissolution and to withdraw his capital. This may involve a loss for all concerned.[9]

4. THE CORPORATION, ITS BASIC CHARACTERISTICS

The corporation is a complex organization and takes many shapes. For the moment, we shall present a bare outline of the legal characteristics and organizational structure of the corporation.

The corporation is defined as a fictitious person created by the state. It can engage in certain defined activities, and in pursuing its purposes, it can obtain title to or dispose of property, enter into contracts, and engage agents to work and act for it. Of course the corporation is not a human being and can act only through humans hired to work for it, yet the legal fiction of the "corporate person" is nevertheless a highly ingenious device. It enables the corporation (i.e., the properly state-sanctioned organization) to take responsibility and liability for legitimate activities which otherwise would be the final liability of the individuals in the organization. Unless something illegal has occurred, people dealing with the corporation must satisfy their claims against the corporation and may not look to those behind the company for ultimate settlement.

The limited liability of the owners is the single most important characteristic of the corporation. Limited liability simply means that in case of failure the owner or stockholder may lose what he has ventured in the firm, but even if the company cannot pay its creditors in full, the shareholder's personal assets cannot be endangered.[10] (The feature of limited liability is denoted in Great Britain by the abbreviation, LTD (limited), placed after the company's name. In France it is denoted by the abbreviation, S.A., (Societé Anomie) the company of nameless ones. (The concept, of course, is that the owners cannot be named in a legal suit.) Because it possesses limited liability, the modem business corporation provides a method for many people to risk their funds in a distant organization, perhaps with the chance of gain if the business goes well, but with a definite limit of loss if the worst should happen. We will briefly trace the evolution of the modern corporation in Chapter 18. It is hard to imagine how the large corporations with their funds amassed from many individuals could have developed without this provision.

Another important aspect of the corporate form is that its ownership shares are transferable. Unlike the partner, the owner of a share in a corporation has the inherent right to sell or give away his holdings without the consent of the other shareholders,[11] the new holder acquires the same rights and privileges as the original owners. The characteristic of transferability is especially important to the development of modern free enterprise economies since it provides a high degree of capital mobility. Indeed, the ready transferability of corporate shares makes possible the whole intricate structure of capital markets.

The length of life of the corporate firm is independent of its stockholders. If a shareholder dies, his heirs take title to his shares, and the other surviving stockholders have to accept the new owners; there is no legal problem of "succession." The corporation virtually has "perpetual life." Although most corporation charters granted by the states run from twenty to forty years and only a few are perpetual, most charters may be renewed with ease.

The corporation is a stable form of business organization because it can be dissolved only by a majority vote of the stockholders. In contrast, the partnership is dissolved on the death of a partner or on the request of any partner if he does not approve of the way the partnership is run or if he is displeased with his present or potential partners. In exchange for stability, the shareholder sacrifices the greater flexibility and the choice of associates inherent in the partnership. If the shareholder does not care for the other stockholders or if he thinks he can use his capital more productively elsewhere, his only remedy is to sell his shares for what he can get. The corporation shareholder cannot obtain dissolution of the firm merely by asking.

The single proprietor or the partners take direct responsibility for managing their firm. The owners of the corporation (i.e., the stockholders) have only an indirect role in the actual management of the company. The stockholders have the right to vote to elect a board of directors, who then appoint corporation officers, a President, Secretary, Treasurer, and various vice presidents, to run the business and make the day-to-day decisions for the firm. In a closely held company, where one man or a small closely connected group holds a majority of the shares, the major stockholders, the Board of Directors, and the management (i.e., the major officers) may all be the same people. In general, a widely held corporation is one where no single stockholder or close group of stockholders holds anywhere near a majority of the shares. Nevertheless, the management (though it usually holds only a small minority of the total shares) is the dominant voice in the corporation's affairs. In theory, the Board of Directors has strong powers. In actuality, the directors are nominated by the management and upon election reappoint the corporate officers.[12] The stockholders almost invariably vote for the management slate; usually it is the only group running. The voting rights of the stockholders have become in practice a remote, ultimate power that might be used if the firm is badly mismanaged.[13]

The prevalence of management power over that of the shareholders has led to the development of Agency-Principal theory, which we discuss in Chapter 22. Agency theory deals with the methods, the types of compensation and other encouragement that the shareholders-owners (the principals) might devise to tie the operations of the management (the agents) to the basic interests of the shareholders.

Although the lack of influence the average stockholder has on the actual direction of the firm is often considered a drawback of the corporate form, it is not entirely a disadvantage. Most investors are not interested in the ordinary business decisions of the firm. They usually have other concerns, and they would consider it burdensome to devote any considerable time to the operation of the company. The large corporation develops its own management, which after time achieves certain autonomy, may develop a professional outlook, policies, traditions, and very likely a considerable devotion to the affairs and success of the company. Although the remuneration of management may be considerable, and even if at times it may take unfair advantage of its power, in the majority of corporations, the economic interests of the shareholders are well served by the corporate structure.

In regard to federal income taxation, the status of the corporation is quite unique. Since the corporation is a legal personality in its own right, it is taxed independently on its profits. The stockholders are further taxed at the individual tax rates for the profits they receive in the form of dividends or at the capital gains rate when reinvested earnings raise the value of shares and these shares are sold at a profit. Because profits have already been taxed once, corporations are described as being subject to "double taxation." In certain circumstances, however, the corporation form may actually offer some tax advantages. For example, if a firm whose owners are in a high income tax bracket is in a profitable growth stage, it may retain a considerable proportion of its profits for reinvestment in the business. These may later be taxed at the lower capital gains rate. In any case, the other favorable aspects of the corporate form may decisively outweigh any extra tax burden.[14]

5. CHARTERING THE CORPORATION

Since the corporation is a "creature" of the state, its formation requires a more complicated legal procedure than other forms of businesses. The legal "soul" of the corporate "personality" is the charter granted to it by the state.

The history of the corporation charter and of the relationship between the corporation and the state is a long one. The notion of some semiautonomous body functioning under a charter was not unknown in Roman law. Charters bestowing a grant of power by the sovereign to a subsidiary body existing under his control were used in the medieval times to define the relation between the crown and monasteries, certain guilds, universities, towns, etc. In England, the king later granted charters to various trading company (actually independent merchants who formed a market) to engage in certain trades, deal in specific commodities, pre-empt certain geographical markets, or settle colonies. Lloyds of London, an association of insurance firms, is a survivor of these early-chartered companies. Some companies were financed with transferable stock and developed a definite resemblance to the modern corporation. The early charters almost always contained some type of monopoly privilege.

In time, British companies wishing to engage in regular commercial activities began to request charters from Parliament, who had begun to exercise this power on behalf of the Crown by about 1688. Each of these requests had to be passed upon separately. Action on these charters not only became a burden upon other legislative activities, but suspicion arose that favoritism existed in the granting of charters. In 1845, a general enabling act set up an administrative office to pass upon corporate charters. Any company fulfilling the standard requirements received a charter; the enabling act, moreover, redefined the concept of limited liability.

In the United States, developments ran parallel to those in England. The right to grant charters rested with the state legislatures. At first, each request for a corporate charter had to be passed on separately.[15] The politicking, favoritism, and sheer bribery that went into securing a charter became an overt scandal. In 1825 Connecticut passed the first inclusive general enabling act. In time all the states passed similar laws; they provided a procedure whereby the promoters of a business corporation who submitted their application in the proper form to a designated state official were automatically granted a charter.

Just how the grant of the charter defines the relation between the state and the corporation is still a matter of theoretical legal discussion. According to the "fiction theory" of the corporation that comes from the old common law, the corporate personality is a legal fiction of the state subordinate in every way to its creator. The "contract" theory, which has its roots in Roman law, holds that there was a vague but nevertheless existing antecedent body to the final corporation with which the state has made a binding contract by granting a charter. This theory would seem to limit severely the powers of the state to intervene in any way in the corporate structure. Yet in practice the two theories have moved closer together. The corporation charter is almost inviolate and cannot be abrogated unless the parties behind the corporation have used it for fraudulent or criminal purposes. Under extreme provocation the courts may pierce the "corporate veil" and hold the people maneuvering the corporation personally responsible for illegal actions, as we are currently seeing with many of the individuals associated with WorldCom, Enron, and Tyco.

A firm that plans to operate as a corporation can charter in any state; there is no requirement that it charter in the state where its business is located. The procedure of obtaining a charter and the power it gives the corporation varies from state to state. By making chartering a matter of course, the general enabling acts removed the competition of different groups within a state to secure a charter for their enterprise and possibly block the charter application of some rival. However, competition soon developed between the states to write easier enabling acts to induce corporations to charter with them. In their desire to obtain fees and annual franchise taxes (and bring business to local lawyers), some states reduced the difficulties in securing a charter, lowered fees, and, most importantly, widened the corporation privileges and powers allowed in their charters.[16] The striving by individual states for corporation chartering fees (which realistically have never amounted to much) by making incorporation easier and permitting wider corporate powers has been called "competitive laxity." One may wonder whether the United States would not have developed a simpler, more uniform, and possibly more responsible corporation managerial and administrative structure if the right to grant corporate charters had been reserved to the federal government in the Constitution.

Among the factors a firm may consider before deciding upon the state in which it charters are differences in taxes such as chartering fees and the annual franchise taxes. The federal corporation profit tax does not differ no matter where the corporation is chartered; neither do the local property taxes, which are based on where the fixed assets of the company are located; nor the state corporation income taxes, which are set on where the firm does business. Chartering fees and annual franchise taxes are a minor fraction of the taxes a corporation is subject to and hardly the major influence in the choice of state in which to charter.[17] More likely the "liberality" of the charter provisions influence the choice of domicile (i.e., the state in which the charter is obtained); but even this was more crucial in the past than it is today. Most newly formed corporations obtain their charter in the state in which they intend to locate the major part of their business.

A single proprietor or partnerships whose principals have legal residence in the United States have the constitutional right to operate in any state. However, a corporation, although a legal personality is not a citizen and has no inherent constitutional right to locate in states other than the state in which it is domiciled. We briefly trace the development of incorporation of holding companies, and the creation of the modern corporation in Chapter 18. In legal terminology, a corporation operating in the state in which it is chartered is called a domestic corporation, one operating in a state other than that in which it is chartered is a foreign corporation. A corporation of another nation is an alien corporation. Actually, a high degree of reciprocity prevails, and the states have not placed severe discriminatory restrictions on foreign corporations. A foreign corporation is generally required to pay an annual registration fee; the amount is usually equivalent to the annual franchise taxes paid by domestic corporations.

6. ADMINISTRATIVE ORGANIZATION

The overriding law applying to the corporation's government in any state is the state constitution; statutes passed on corporation matters, and court decisions that establish precedents. Where a corporation's charter or by-laws are in conflict with existing state laws, the charter or the by-laws must give way. Therefore, it is necessary to know that state law (or external law) in order to interpret properly the charter and the by-laws (or internal law) of the corporation.

The charter (or certificate of incorporation) is the corporation's right to legal existence, and it also states the general organization, authorized capitalization, the business and purposes of the company. Ordinarily the charter does not make detailed provisions for running the affairs of the corporation. At the first meeting of the stockholders after the charter is obtained, a set of by-laws is adopted, covering such topics as the election and remuneration of a board of directors, the establishment of the corporation offices and the definition of their powers and duties, the issuance and transfer of stock, methods of voting, and other matters pertaining to the management and administration of the company.

Although all corporations go through the formality of passing by-laws and electing directors, the practical importance of this procedure is determined by the structure of the ownership. By far the vast majority of corporations are closely held, closed, or family-held companies where a single individual, family, or closely related group holds all the shares. The closely held corporations are generally small, the principals are in close contact, and there is a minimum of formality in the procedures of administration. Much of the discussion that follows pertains to the widely held corporation.

After the board of directors have been elected (pursuant to the by-laws), it appoints the corporation officers. These might consist of a President, Secretary, Treasurer, Controller, and several vice presidents. The president is the chief executive officer (CEO) of the firm; he and the other officers direct, manage, and take responsibility for the regular operations of the business. In some firms, the chairman of the board of directors has a powerful position as overall strategist of the company; nevertheless, the president is usually in charge of the major internal affairs of the corporation. In some companies, basic administrative power may rest in an executive committee, consisting perhaps of the major officers and selected members of the board. Often the major officers are also on the Board of Directors. As we have already indicated, in the going corporate concern, power to control the corporate affairs usually shifts from the stockholders through the Board of Directors finally to rest largely with the management.[18] The board is generally composed of the management's nominees, and the management's choice is voted down only if a dissenting group obtains enough stockholder votes to install a new management (and this seldom occurs).

A Board of Directors composed mostly of persons holding executive positions in the company is known as an inside board. A Board of Directors with some outside members is known as a mixed board. In its March 10, 2003 10-K filing for the year ended December 31, 2002, IBM lists its Board of Directors. The Chairman of the Board, President, and Chief Executive Officer, is Samuel Palmisano. The executive officers of IBM are elected by the Board of Directors, and serve until the next election (annually). Who is the Board of Directors of IBM? In 2002, the IBM Board had 15 members, and included Kenneth Chenault, the Chairman and CEO of American Express Company, Nannerl Keohane, the President of Duke University, Sidney Taurel, the Chairman and CEO of Eli Lilly and Company, John Thompson, the Vice Chairman of the Board at IBM, Charles Vest, President of MIT, and Lockewijk C. VonWachem, Chairman of the Supervisory Board of the Royal Dutch Petroleum Company. The IBM Board of Directors is a mixed board.

The DuPont Board of Directors for 2002 include Charles Holiday, the Chairman of the Board and CEO of DuPont, Richard Brown, the Chairman of the Board and CEO of Electronic Data Systems (EDS), Lois Juliber, Chief Operating Officer, Colgate-Palmolive Company, Edward B. DuPont, Deborah Hopkins, Head of Corporate Strategy at CitiGroup, Inc., and Charles Vest, President of MIT.

The Dominion Resources 2002 Board of Directors is a mixed board. Its members include its Chairman, President, and CEO, Thomas Capps, William Barrack, former Senior Vice President of Texaco, Inc., Peter Brown, and Frank Royal, physicians, Margaret McKenna, President of Lesley University, and Steven Minter, President and Executive Director, The Cleveland Foundation.

The American Management Association has been in favor of outside directors; they feel such people may bring constructive, fresh, and critical insights to the board and provide a useful review of company and managerial policies.[19] The inside board is defended on grounds of efficiency; it is felt that the members of the board are able to act expeditiously if they are intimately acquainted with the problems they must deal with.

Contrary to popular impression, generally directors as such are not extremely highly compensated, although many firms pay directors annual fees of $50,000, plus additional fees for committee meetings. There is a question when the directors are excessively complimented, $350,000 plus annually e.g. Enron, whether they will exercise any discretion on the corporate activities. Being on the board of a company is often considered an honorific position. (In most corporations a director does not initially have to be a stockholder of the firm.) Many prominent directors hold positions on a large number of boards. Under these circumstances, it is no wonder that the directors are often willing to accept the management's account of its stewardship and generally approve the programs that management proposes.

Just what are the responsibilities of the directors? The matter is not yet clearly decided in law. On a formal basis, the directors appoint the company officers approve executive compensation, approve dividend declarations and stock splits, and pass on major expansion plans or changes in company policies. The DuPont Board of Directors serves on various committees, including the Audit Committee, Compensation Committee, Corporate Governance Committee, Environmental Committee, and Strategic Direction Committee. In practice, the directors seldom initiate any policies but abide by management's suggestion. Moreover, matters of special interest are usually put to a special vote of the stockholders. The question is the degree of attention and care the directors owe to the affairs of the corporation. In the past, directors have often been cavalier in looking after the interests of the public stockholders. For some time, however, there has been a move in practice and in law toward regarding the directors as being in a quasi-fiduciary position. Holding a position of quasi-trust, the directors should exercise due care in protecting the equity of the stockholders. He should protect the stockholder against fraud and obvious malfeasance and make sure that he is fully informed on the corporation's condition and policies. A necessity for full disclosure holds with especial force when the director himself engages in a transaction with the corporation; it is important that the director not take advantage of his position to underpay the corporation or overpay himself or other interests he might represent.

Because they can be subject to stockholder suit, it can at times be difficult to recruit directors. To overcome this difficulty most corporations purchase liability insurance for their directors.

7. MAJOR RIGHTS OF THE SHAREHOLDERS

The main value in owning stock in a publicly held corporation is the dividends and or capital gains that may be reasonably expected over time. The average shareholder depends on the innate fairness, reliability, skill, and good will of the management to give him a reasonable distribution of the gains accruing to a successful enterprise. Rights inhering to the stockholders, protect them, to some degree, against arbitrary or capricious management. In practice these rights give only a negative protection; they may be a distant threat to some managements which might otherwise forget their obligations entirely.

The stockholders have the right to vote for the board of directors. Voting is done by share; each share equals one vote. An owner of 100 shares of IBM stock votes his or her opinion, although with an average of 1,720.4 million shares outstanding in 2003, such an owner might not feel terribly important. The stockholders may vote by attending the annual meeting, or they may authorize someone else to vote their shares for them. Such an authorization is called a proxy. The majority of proxies go to the management representatives. An innovation proposed some years back by students of corporation organization, and actually adopted by a few companies, is cumulative voting for the directors. Cumulative voting is a system of proportional representation. It allows a sufficiently large minority of the shareholders to concentrate their votes on one or more directors in order to achieve representation on the board. Under a straight voting system, where each position on the board is voted for separately, it is clearly possible for a bare majority to place every one of their candidates on the board, thus excluding any minority views entirely.

The proponents of cumulative voting argue that it is in the firm’s interest to have a different point of view represented and that the minority directors will tend to check excesses of the majority. Opponents of cumulative voting point out that a dissident minority could get representation on the board merely to harass the normal operations of the company.

As has been pointed out, the shareholders almost always vote to retain the existing management. (This may be a fairly wise procedure; managerial talent is not necessarily in oversupply.) On occasion, however, a rebellion of stockholders (often dominated and financed by major shareholders who would like to be the new management) has succeeded in taking over a company. The stockholders generally have to be well aroused by extraordinarily poor management for this to occur. Nevertheless, although such rebellions are rare, the lesson is not entirely lost on other managements.

The shareholders are usually called upon to vote on any major change in the corporate structure. These changes may entail modifications or amendments of the by-laws, an increase in authorized shares, permission to float a convertible issue, a major expansion, a merger, a bonus or profit-sharing plan, a pension program or stock options for the company executives. Generally, the shareholders approve the management's proposals.

The shareholder has the right to examine the company's books. This gives him some protection against possible fraud or manipulation of the accounts. It also provides him with the list of shareholders he needs to attempt a proxy drive to change the management. On the other hand, the right to examine the records can be put to unethical uses: to obtain a list of customers for a rival firm, to obtain a list of stockholders to solicit for other enterprises, to look for trade secrets, or otherwise harry the management. But the shareholder that wishes to examine the company's records at a reasonable time and place is allowed to do so.[20]

An important right of the stockholder is the right to institute a stockholder suit against the management on behalf of himself and the other stockholders. The right of the stockholders to sue on behalf of the company may be a powerful deterrent against an errant management. Many times such suits are mere nuisances, started in hope the management will make some sort of settlement rather than fight through the courts; often, however, the results of the suits have been startling; uncovering fraud, manipulation, conflicts of interest, or pure stubborn mismanagement. If the stockholder wins his suit, he collects only court costs for himself; the damages are paid by the parties liable (the company executives and directors, as the case may be) to the corporation treasury.

In the vast majority of states, corporation stockholders enjoy the pre-emptive right or the right of privileged subscription. Existing shareholders are given the privilege of purchasing – in proportion to their holdings – the shares of a new issue of stock before these are offered on the general market. The pre-emptive right is said to give the stockholder the opportunity to preserve his proportionate interest in the corporation.[21] By exercising his or her rights, the existing shareholder can maintain the same proportionate claim to the firm's assets as he already has or maintain the same proportionate voting strength.[22]

Although often described in political-legal terminology the major function of the pre-emptive right is economic. It provides the shareholder with a compensating device if new stock is being floated at a price below the present going market price. (New shares are usually issued below the market price because it makes their flotation easier.) If the shareholder wishes, he can sell his rights, or he can exercise his rights and buy the new shares at the "offering" price. In either case, he loses no financial advantage to the newcomer shareholders.

8. THE ADVANTAGES OF THE CORPORATE FORM

When set against the possible machinations of the management, the protective rights of the shareholders hardly seems very strong. And it is true that innumerable cases can be cited where the management has taken advantage of the apathy, helplessness, or lack of knowledge of the stockholders to enrich themselves. On the other hand, such things have "also happened in government, politics, labor unions, social groups, and even religious organizations, and it is no more inherent in one [the corporation] than it is in another. Whatever may be the possibilities of unfair or unethical practices, it is probably true that the overwhelming majority of corporate managements are faithful to the trust they hold."[23]

In spite of its weaknesses, the corporate form gives many advantages to its stockholders (owners). If this were not so, it would be hard to account for the growth and economic dominance of the corporation over other forms of private business organization. Essentially, the corporate form permits the pooling of large amounts of capital from many sources (institutional and private) because it does not obligate the individual investor to be active in the affairs of the business nor subject him to worry over personal liability for business debts.

At most periods in our history the publicly held corporation has been able to raise capital with relative ease because over time investment in a diversified portfolio of corporation shares has shown a comparatively good rate of return. As a corollary, in our economy characterized by the growth of industries requiring heavy capital investment, large-scale operations, and specialized professional managements, the corporation's ability to amass funds and to develop responsible administrative staffs has made it the dominant business form.

Notes

[1]Estimated from Statistical Abstract of the United States, 2003, U.S. Department of Commerce, Bureau of Census, p. 495, and Survey of Current Business, 2001, U.S. Department of Commerce.

[2]Ibid.

[3]Some kinds of enterprise may require a license. A license, however, is necessary only in certain activities-usually occupations where special skills or sanitary or hygienic considerations are involved-and not to the form of business organization.

[4]In case of bankruptcy, the rule of “marshaling the assets” is followed. Business assets are used first to satisfy business debt and personal assets satisfy personal debt first. Thus, if the ratio of debt to assets differs in the two categories, the rate of settlement for the different classes of creditors are not the same.

[5]For example, one partner may, without the express consent of the others sell part of the normal inventory to a third party. The contract would hold, even if afterward the other partners should disapprove of the price or any other term of the sale. But a contract for the sale of major equipment might not be considered binding without the consent of the other partners if such a sale appeared to be outside the normal operations of the business.

[6]There is a variant of the partnership known as the limited partnership where one or more partners may limit their liability to their investment in the firm. There still must be at least one general partner.

[7]Unless stipulated otherwise, losses are shared on the same basis as profits. If there is no express agreement, profits and losses are shared equally by the partners.

[8]Legally any payment of interest or salaries to the partners is not an expense but merely a way of distributing the partnership profits. However, these are generally subtracted on the accounting statements as an operating expense in order to obtain a pro forma profit figure.

[9]At that, the defensive weapon of calling for dissolution may be better than anything available to the minority stockholder in a small corporation.

[10]Unless, as sometimes happens in a closely held corporation, the major shareholder personally endorses the corporation’s note in order to obtain additional credit, or he has failed to pay in the full par value of the stock. This last possibility is not too likely in practice.

[11]Rights such as these can usually be voluntarily abridged. Thus a family-held corporation may require that a stockholder offer his shares to the corporation or other existing stockholders (at some fixed price) before he may sell them to someone else.

[12]In exercising independent choice in the appointment of officers, most boards resemble the electoral college since they are already pledged to a given set of candidates. In the rare

instances of a contest for control, the management runs one slate of directors and the dissidents nominate an opposing slate.

[13]This is an old story. The gap between the theoretical right of the stockholders to run the firm through the election of the board of directors and their general helplessness in practice was labeled "the separation between ownership and control" by Berle and Means in *The Modern Corporation and Private Property*, Macmillan, 1933.

[14]Under the present tax laws, some closely held corporations which satisfy the requirements may elect to be taxed as partnerships. It depends on the individual situation whether this is advantageous.

[15]Government corporations, e.g., municipalities, authorities, etc., still usually require individual action by the legislature to get a charter. The various federal corporations such as the Federal Reserve Banks, and the Federal Deposit Insurance Corporation were chartered by separate acts of Congress.

[16]Many national corporations are chartered in Delaware, not so much because the fees are low but because Delaware was one of the first states to allow extensive holdings of the shares of other corporations. Thus Delaware became an ideal state to charter controlling and holding companies.

[17]Taxes may influence the location of the business, but that is a different matter from where it is chartered.

[18]Of course, all sorts of possibilities have to be allowed for. In some companies a dominant stockholder may be the real ultimate power, although he may elect not to be an officer or perhaps not even hold a seat on the board.

[19]On the other hand, outside directors are likely to have many interests, perhaps as officers of other corporations or serving on the boards of many other companies. They may be able to give no more than perfunctory attention to the matters at hand.

[20]Stories have arisen that some company's books are kept in cobwebby, cold vaults to discourage nosey stockholders. These stories are not wholly accurate.

[21]Both the pre-emptive right and general voting rights are commonly denied to preferred shareholders by charter provision. In a few states it is possible to deprive the common stockholders of the pre-emptive right in the charter. The pre-emptive right on a particular issue can be waived by a vote of the shareholders.

[22]Rights are not given on the flotation of a security other than common stock unless the new issue is a convertible one (i.e., it can be changed into common stock at the option of the holder).

[23]Chelcie C. Bosland, Corporate Finance and Regulation, Ronald Press, 1949, p.69.

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Chapter 3

THE CORPORATION BALANCE SHEET

This chapter on the balance sheet and the following one on the income statement are designed to serve two modest purposes: to acquaint the student with accounting and financial terminology and concepts used throughout the book, and to explain the two important accounting statements on an uncomplicated level so that the student can appreciate and use some of the information presented by the accountants. It is not the purpose of these chapters to review all the procedures of accounting.

1. THE BALANCE SHEET

The balance sheet is the financial picture of the firm at a precise point of time. The left side of the balance sheet lists, categorizes, and sums the assets, the items of value the firm owns at a given point of time. The right side lists the debts and other payment obligations that the firm owes; these are the liabilities. The difference between the liabilities and the assets is the net worth, equity, or ownership capital. The liabilities plus the net worth of the firm must equal the sum of the firm's assets. The balance sheet then presents this equation:

The sum of the assets = The sum of liabilities plus stockholder equity

Although the balance sheet or position statement is a useful quantitative picture of a firm's financial position, it is not an exact reflection of the firm's economic worth. The balance sheet is constructed on the basis of formal rules and does not necessarily represent the market value of the firm as either a growing concern, or liquidated (sold off) entirely. Moreover, the balance sheet represents the financial position' exactly at 12:00 midnight on the balance sheet date. The assets and liabilities shown are those accountants have ascertained to exist at that point of time. Since a business is always changing (buying a little here, selling something there, borrowing, lending, paying, and getting repaid), the balance sheet never represents more than an approximate financial truth, even at the moment it is finally put together. The fact, however, that the balance sheet cannot tell us all we should like to know is not an indictment of accounting. The accountant's

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prime functions are to keep legal claims straight, present his data as consistently as possible, and stay as close as possible to objectively determined costs. The financial statements, a compromise between conflicting functions and demands made on the accountant, are the data very often used in making business decisions.

Several points are provided by the balance sheet equation, which holds that total assets = total liabilities + stockholder equity (or total debits = total credits). Therefore, if the firm increases its total assets (buys more goods, acquires new equipment, increases the money owed it by extending more sales credit), it follows that either the liability or stockholder equity (ownership accounts) must also increase to balance the rise in assets. The firm may increase the amount it owes its suppliers, borrow from the banks, float a mortgage bond issue, or it may increase its net worth by floating additional common stock or retaining additional earnings in the business. The issuance of debt increases the firm's interest expense, which it must pay to remain in business, but debt issuance does not possibly dilute the ownership and voting interests of management, inherent in an equity issuance. The problem of whether or not to acquire additional assets and the related question of choosing the best source out of which to finance the additional assets are a central area of financial decision making, as the reader will see in Chapter 11. That is, management should finance the expansion of assets by pursuing the debt or equity strategy that maximizes the stock price of the firm.

2. ASSETS

The assets which the nonfinancial firm may acquire or own are usually broken down into three major categories: current assets, fixed assets, and other assets. The current assets and the fixed assets are usually much larger than the other assets.

Current Assets. The current assets consist of cash, items that in the normal course of business will be turned into cash within a short time (the accountants use the rough measure of one year), and prepaid items that will be used up in the operation of the business within the year. The three largest accounts making up the current assets are usually in cash, receivables, and inventories.

Cash. Cash is the sum of the cash on hand held out to make change and provide petty cash funds, and the deposits in the bank. IOU's, advances to employees, etc., are not counted in the cash account.

Receivables. The receivables are amounts due the firm from custommers who have bought on credit. They are often segregated into accounts receivable and notes receivable. An account receivable is the usual way credit is given in American business practice. It simply means that the buyer of the goods is charged for his purchases on the books of the seller – no other "formal" legal evidence is prepared. This type of credit is often called "book" or "ledger" credit.

If a note receivable is used, the purchaser of the goods has signed a promissory note in favor of the seller. A note, except in certain lines of business where they are customary, is generally required only of customers with weaker credit ratings or those who are already overdue on their accounts.

An account called reserve for bad debts or allowance for doubtful accounts is generally subtracted from the receivables. This is called a valuation reserve; it is an attempt to estimate the amount of receivables that may turn out to be uncollectible. The receivables minus this reserve, the net receivables, is counted as an asset on the balance sheet.

The receivables do not normally contain advances or loans that are not part of the normal business or sales operations of the firm. Loans to officers or employees or advances to subsidiaries are generally included in the other assets. Also, except for financial firms – banks and finance companies – such items as accrued interest receivable are usually not included with the other receivables.

Inventories. Inventories are items making up the finished stock in trade of the business and the raw materials which in a manufacturing firm will in due course be turned into the finished products. In a mercantile or distributing firm the inventory consists basically of "finished goods," that is, items which the company does not have to process further. In manufacturing companies the inventory divides into three categories, raw materials, work in process, and finished goods. If we consider the current assets from the "flow of funds" aspect, that is, how close they are to being turned into cash, cash will be listed first, of course, next receivables (representing generally sales made but not yet collected), and then inventory. Obviously, for the going concern, finished goods are more current or liquid than work in process, and work in process more so than raw materials. The relative composition of the inventory can become a matter of importance – sometimes unfortunately overlooked-in analyzing the current credit position of a manufacturing firm. An inventory of 286 or 386 personal computers (PCs) are of little value to a computer firm.

A problem in presenting inventory values on the balance sheet is to keep separate the amount properly ascribed to supplies. Supplies are not part of the normal stock in trade nor are they processed directly into finished goods. Stationery and stenographic supplies, coal used for heat or power, wrapping material used in a store, are obviously supplies. It is difficult, however, to classify packaging items that are a distinctive part of the final product in a manufacturing concern, or the coal pile of a steel plant. In general, an item that is an integral part of the final product is part of the raw material inventory, whereas items used in corollary functions are supplies. Supplies are usually placed with the miscellaneous current assets; like the prepaid expenses, they represent expenditures made currently which save outlays in the future.

Valuation of the inventory is an additional problem with which the accountants must wrestle. The usual rule of valuation is "cost or market, whichever is lower." This rule gives a conservative value to the inventory. The inventory is marked down in value if prices have declined since the items were purchased; but if prices have risen items are valued at their cost to the firm.[1]

Firms may now make a choice between the rule of "first-in, first-out" (FIFO) and "last-in, first-out" (LIFO) as methods of inventory valuation. Under FIFO (which most firms still use) it is considered (whether physically true or not) that sales have been made of the older items, and that the items most recently manufactured or purchased compose the inventory. Conversely, if LIFO is used to value the inventory, then the new items coming in are considered to enter the cost of goods sold, and the cost of the older stock sets the value of the inventory. Under the first method, FIFO, the value given the inventory on the balance sheet is meaningful, but the cost-of-goods-sold figure used on the: income statement may not truly represent current economic costs if price levels have been changing rapidly. Under FIFO the accounting figure for cost-of-goods-sold tends to lag behind price level changes, so that reported accounting profits are large on an upturn and decrease rapidly (or turn into reported losses) on a downturn in prices.[2] On the other hand, LIFO reduces the lag in the accounting for cost-of-goods-sold when price level changes, thus modifying the swing of reported accounting profits during the trade cycle. The LIFO method of inventory valuation, however, tends to develop an inventory figure on the balance sheet that may not be at all representative of any current cost or price levels. The asset value of the inventory may become more and more fictitious or meaningless as time passes.

Nevertheless, many large companies surveyed annually by the American Institute of CPAs (AICPA) had switched to LIFO by 1981 [Horngren (1984)]. In 1994, corresponding AICPA survey had 351 large firms using LIFO, with 186 firms using LIFO for 50% or more of its inventories.[3] The larger the firm's inventory balance, the greater is the potential tax savings for LIFO companies. However, in defense of FIFO, any distortion it produces on the profit and loss statement is not very great for firms that turn over their inventory rapidly, i.e., for firms whose stock is replaced rapidly in relation to their sales. In fact, one of the earlier studies of market efficiency by Sunder (1973) found no significant excess returns for firms switching from FIFO to LIFO in inflationary times (from the date of the change), whereas firms switching from LIFO to FIFO experienced a drop in excess returns of over 8 percent.

Miscellaneous Current Assets. Other current assets besides cash, receivables, and inventories are accruals, prepaid expenses, and temporary investments. Accrued items are amounts which the firm has earned over the accounting period but which are not yet collectible or legally due. For example, a firm may have earned interest on a note receivable given to it in the past even though the note is not yet due. The proportionate amount of interest earned on the note from the time it was issued to the date of the balance sheet is called accrued interest, and under modern accounting procedures is brought on to the books as an asset.

Prepaid expenses are amounts the company has paid in advance for services still to be rendered. The company may have paid part of its rent in advance or paid in on an advertising campaign yet to get underway. Until the service is rendered the prepayment is properly considered an asset (i.e., something of value due the firm). When the service is rendered, the proportionate share of the prepaid item is charged off as an expense.

Temporary investments are holdings of highly marketable and liquid securities representing the investment of temporary excess cash balances. If these are to be classified as a current asset the firm must intend eventually to use these funds in current operations. If, however, the securities are to be sold to finance the purchase of fixed assets or to cover some long-term obligation, such holdings are more correctly grouped with the other assets or miscellaneous assets.

Fixed Assets. The fixed assets and the current assets are the two important asset classes. The fixed assets are items from which the funds invested are recovered over a relatively longer period than those invested in the current assets. Long-term receivables are included in fixed assets. The fixed assets are also called capital assets, capital equipment, or the fixed plant and equipment of the firm. The annual balance sheet usually lists a Property, Plant & Equipment-Net figure, composed of Property, Plant & Equipment-Gross, less accumulated depreciation. Almost all fixed assets except land are depreciable. Mineral deposits or reserves and standing timber are considered depletable, and are important for mining and petroleum firms. In determining the value of a fixed asset, we must remember that their economic life is not unlimited, that eventually they will wear out or otherwise prove economically useless in their present employment. The accounting reports allow for the loss of value on fixed assets through the passage of time by setting up a reserve for depreciation, allowance for depreciation, or accumulated depreciation account. Every fiscal period a previously determined amount is set up as the current charge for depreciation, and is subtracted as an expense on the income statement. The matching credit is placed in the allowance for depreciation account, where it accumulates along with the entries from previous periods until (1) the allowance for depreciation equals the depreciable value (original cost less estimated scrap value) of the asset or (2) the asset is sold, lost, or destroyed. On the balance sheet the allowance for depreciation constitutes a valuation account or reserve; the historically accumulated depreciation is subtracted from the original acquisition cost of the fixed assets, and the balance, called net fixed assets, is added into the sum of the total assets.

The problem of making adequate allowance for depreciation and determining the periodic depreciation charge has caused considerable difficulty for the accountants. A commonly used depreciation method presented to the public on the reported books is the "straight-line" method. This technique is quite simple (accounting, among other reasons, for its popularity). The probable useful life of the asset is estimated; the estimated scrap value of the asset is deducted from its original cost in order to obtain its depreciable value; the depreciable value divided by the estimated life gives the yearly depreciation charge. The depreciation charge deducted as an expense remains the same year after year though the net book value of the asset is constantly reduced. For example, assume a warehouse has an estimated life of 20 years, an original cost of $225,000,000 and a $25,000,000 estimated scrap value. The yearly charge will be $10,000,000 per annum or 5 per cent of its depreciable value. At the end of ten years the accumulated allowance for depreciation will be $100,000,000 and the net asset value, of the warehouse will be carried at $125,000,000.

Although the straight-line method is popular for the public accounting reports, a constant depreciation charge does not reflect the fact that for most fixed assets the loss in economic value is higher in the earlier periods of use. Because of this, the Bureau of Internal Revenue allows firms to adopt alternative, accelerated depreciation policies (such as the Accelerated Cost Recovery System, ACRS, instituted in 1981 and modified by the Tax Reform Act of 1986. Most industrial equipment is classified as having a seven-year life in ACRS, which allows firms to depreciate annually 14.29%, 24.49%, 17.49%, 12.49%, 8.93%, 8.93%, 8.93%, and 4.45%, respectively, in years one through eight. The great tax advantage of the accelerated depreciation is that it allows the company to defer some of its income tax liabilities to the future, thus providing a greater current after tax cash flow. Accelerated depreciation is a significant tax saving in present value terms. Currently most firms fudge their reporting; they use accelerated depreciation for tax reporting and straight line on the reports presented to the public. The difference is captured in an account labeled deferred income taxes which represents the difference between the taxes paid under accelerated depreciation and what the tax would have been if straight depreciation had been used. Presumably sometime in the future when the accelerated depreciation runs out, the tax charge will rise. However, given many possible tax and economic changes, the amount of future taxes is uncertain.

Actually reporting would be better, closer to the economic truth, and nothing would be lost if companies used accelerated depreciation on their public books. The sophisticated investor would understand the compensation of increased after-tax cash flow for the decrease in current reported book earnings.

Depreciation allowances are generally based on the original acquisition cost of the fixed asset to the firm. Any subsequent change in the value of the fixed asset – for example, through price level changes – is generally not reflected in the value of the asset on the books nor in the allowable depreciation rate. The depreciation rate is set by the original purchase price and is not changed for the new price level that may exist currently.[4] Thus even if the funds released to the business by its depreciation allowances were actually segregated (which they are not) for the replacement of fixed assets, they would not prove adequate if the replacement or reproduction cost of these assets had gone up in the meantime.[5] Many authorities have argued for changes in the basic accounting system that would adjust depreciation rates to movements of the general price level. While there is much in favor of such a reform, many practical difficulties stand in the way. Moreover, many accountants and public finance experts argue that the accountants' job is to measure and keep track of explicit costs and explicit legal claims as best they can; to introduce cost changes that do not reflect an actual transaction might put all accounting on an estimate, guess, and valuation basis.

In any case, much of the argument for current cost depreciation is deflected when accelerated depreciation is used. Because a large part of the depreciation is taken "up front," future changes in the value of the asset are of much less importance.

Akin to the allowance for depreciation is the account called allowance for depletion which appears on the books of mining or extractive companies and other companies, such as lumber firms, engaged in processing natural resources. The accumulated depletion account represents the proportionate cost of the amount of ore, crude oil, etc., that has been removed since the company started operation. It is subtracted on the balance sheet from the original acquisition costs of the company's estimated mineral reserves or resources. For income tax purposes, however, most companies take a percentage depletion allowance. (The rate varies for different types of minerals.) The allowable percentage is applied to the market value of the ore or crude oil and is subtracted from income before computing taxes. Under the law annual percentage depletion can continue to be taken even if the accumulated depletion already equals the original cost of the oil or mineral reserves.

Other Assets. Other assets consist of items such as permanent investments and the so-called intangible assets, i.e., goodwill, franchises, trade marks, patents, and copyrights, and deferred charges.

3. LIABILITIES AND STOCKHOLDER EQUITY

The liabilities and stockholder equity section of the balance sheet shows the claims of owners and creditors against the asset values of the business. It presents the various sources from which the firm obtained the funds to purchase its assets and thereby conduct its business. The liabilities represent the claims of people who have lent money or extended credit to the firm; the ownership, capital, net worth, or equity accounts (these terms are interchangeable) represent the investment of the owners in the business.

This, the credit side of the balance sheet, is often called the financial section of the balance sheet or the firm's financial structure. It is especially important to the student of finance. Many of the items found here will be discussed briefly, since they will be taken up in considerably more detail in other parts of this book.

3.1 Current Liabilities

The current liabilities are those liabilities, claims, or debts that fall due within the year. Among the more common current liabilities are accounts payable, representing creditors' claims for goods or services, and notes payable or trade acceptances payable, arising out of similar economic transactions. Owed to bankers, obligations to bankers, notes payable to bank, bank loans payable or similar accounts show the amounts owing to banks for money borrowed. Usually these arise from short-term loans, but the amounts due within the year on installment or term loans are also a current liability. Similarly, any portion of the long-term debt, i.e., bonds, mortgages, etc., maturing during the year is also carried in the current liability section.

Accruals, a common group of current liabilities, represent claims that have built up but are not yet due, such as accrued wages, interest payable, and accrued taxes.[6] An item that bulks large for many corporations today is the amount owing on the federal and state corporation profits taxes. It appears as accrued income tax, provision for federal income tax, or other similar title.

Dividends on the common or preferred stock that have been declared but have not yet been paid are carried among the current liabilities as dividends payable.

The relation of current liabilities to current assets is useful in many types of financial analysis and is especially important in analyzing the short-run credit position of the firm. Thus, the current liabilities are divided into the current assets to obtain the current ratio, and the current liabilities are subtracted from current assets to obtain the firm's net working capital. The larger the current ratio and the larger the net working capital relative to its total operations, the greater is the comparative safety of the firm's short-run financial position. The methods commonly used to judge the safety of the current liability coverage or the adequacy of net working capital vary with the type of firm and industry and with the judgment and analytical ability of the analyst. This subject will be discussed more thoroughly in Chapter 5.

3.2 Long-Term Debt

Under the classification of long-term debt, fixed liabilities, or funded debt is placed the amount the corporation owes on bond issues, mortgage notes, debentures, borrowings from insurance companies, or term loans from banks. The company may have obtained funds to acquire assets and invest in the business from these sources, and this section of the balance sheet shows the amounts still owing.

There are generally three distinctions between the long-term debt and the current liabilities. First, the items making up the long-term debt are usually more "formal" than those in the current liability section. A written legal contract or indenture describes the obligation, contains provisions for repayment under different circumstances, and details various devices for protecting the creditors against default and contains other clauses or provisions which might work to the benefit of the debtor company. The long-term debt is also often composed of “securities,” or printed certificates issued by the corporation standing for evidence of the ownership of the debt which may be freely traded or negotiated. The second important distinction is that the long-term debt will not mature for at least a year and usually for some time longer than that. Moreover, the current liabilities are generally composed of recurring items, whereas the long-term obligations are incurred only on occasion. Third, the majority of long-term obligations carry some interest charge, whereas most current liabilities do not.

3.3 Deferred Credits

Somewhere between the liability and equity section of the balance sheet we often find a category headed deferred credits or perhaps deferred, prepaid, or unearned income. These show a source of funds or assets for which the firm has not as yet performed any service. For example, suppose a company received a cash prepayment for a job on which work is not yet completed. The deferred credit classification does not mean that the firm owes money for this payment but that it owes completion of the project. Furthermore, if the firm has made this contract on a normal basis, some part of the prepayment will not be covered by services or goods, but will revert to the firm as profit. As the contract progresses, the accountants will normally analyze the results to date and apply a proportionate part of the prepayment to expenses, another part to profits (if any), and last leave (among the deferred credits) only that proportion which represents the uncompleted part of the contract.

Among the deferred credits are any rent payments made in advance by the company’s tenants. Quite often unamortized bond premium may appear. If the company at one time issued bonds bearing a coupon interest rate above that of the going market rate at the time, the bonds would have sold on the market at some premium above their face or stated value. This premium is in a sense, then, compensation to the company for their generous interest rate. The premium is amortized over time as reduction against the stated interest payment, i.e., it becomes an offset against an expense item. The unamortized portion is carried as a deferred credit since it is a sort of partial prepayment of the company’s obligation to pay interest.[7] Provisions for risks and charges and deferred taxes also are in total liabilities.

3.4 Common Equity

Common stock, capital surplus, revaluation reserves, retained earnings, ESOP guarantees constitute the majority of common equity.[8] Those terms and other variants are used interchangeably; they mean approximately the same thing, and the student should learn to identify these terms so that he will not be confused if one or the other is used. This section of the balance sheet contains the items making up the ownership claims against the business. It represents the original investments of the owners plus any earnings they have retained in the business, or less any accumulated losses the business may have suffered. Retained earnings change every year by the net income of the firm, less the dividend payment. The firm's retained earnings are the primary source of the firm's cash flow and growth. Common equity is often referred to as the capital section of the balance sheet [Schwartz (1962)].

Preferred Stock. The amount shown as preferred stock represents the par or stated value of the various types of preferred stock issued, sold, and outstanding. The class of preferred stock is usually identified by its stated yearly dividends, i.e., the $7 p'f'd., the $5 p'f'd., or perhaps in percentage terms the 41/2 percent or 5 percent. Although the creditors may classify or consider the preferred issues simply as another form of equity, these shares have a prior claim on dividends and usually in case of dissolution have a claim prior to the common stockholders on the assets. They therefore, from the viewpoint of the common shareholders, take on some of the aspects of a creditor claim.

Common Stock. The common stock account shows the par value or stated value of the common stock issued, sold, or outstanding. It is often said that this account represents the amount that the stockholders originally put into the business, but this is not likely to be literally true and should be modified by our historical knowledge of the firm's financial affairs. In one sense the capital stock account may represent more than the "original" investment, since common stock may have been issued and sold periodically on the primary market as the firm raised funds to expand and to improve its equity base. In another sense the capital stock account may represent less than the original investment, for if in time the value of the firm's stock went over par, or over its stated value, and new issues were sold at a higher price, the difference is classified as capital or paid-in surplus. However, the new purchasing stockholders, at least, might well consider this amount part of their original investment.

Paid in Surplus. The paid in surplus accounts (capital surplus), donated surplus, premium on capital stock, or perhaps investment in excess of par value of capital stock represent funds or assets given to the business on behalf of the ownership interests. These funds or assets do not arise out of the "normal" operations, of the firm but out of certain financial transact-tions. For example, a paid in surplus would arise if someone, perhaps but not necessarily a stockholder, were to donate the firm some assets without asking for stock or other legal obligation in return. Most commonly paid in surplus arises when a firm floats an issue of its stock at more than par value. After a company has been in operation for a time the market value of the stock is more likely than not higher than the par value. The amount the company obtains in excess of the par value is classified as paid in surplus or premium on stock issued, etc. A premium on the issue price of either preferred or common stock is considered paid in surplus.

Retained Earnings. Retained earnings or earned surplus shows the amount that the firm has reinvested in the business out of earnings that could otherwise have been paid out in common stock dividends. This account differs from paid in surplus in that it arises out of accumulated retained earnings and not out of financial transactions.[9] If the firm's operations over time show accumulated losses rather than earnings there is, of course, no retained earnings account but an accumulated deficit, which is subtracted from the other capital accounts on balance sheet. (One year's unsuccessful operation may not create a deficit on the balance sheet, since the losses of the current period may be more than covered by previously accumulated surplus.) The earned surplus accounts are basically derived from this equation: earnings minus losses minus dividends equal retained earnings. For the account to be negative, accumulated losses and dividends over time have to exceed the amounts earned.[10] The retained earnings-to-total assets ratio is a component of the Altman Z bankruptcy prediction model shown in Chapter 5.

Classified among the earned surplus accounts are the so-called appropriated surplus accounts, or reserves. These accounts bear such titles as reserve for contingencies, allowance for plant expansion, or reserve for sinking fund. They are a source of much confusion; they do not represent cash or particular asset any more than the earned surplus account out of which they are derived represents cash or any distinguishable particular asset. These accounts are set up on the books by debiting earned surplus and crediting the allowance; i.e., the unappropriated retained earnings account is reduced, and a surplus reserve account is created by an equal amount. The purpose of these accounts is to warn the reader of the balance sheet that certain events are likely to occur that will reduce either the liquidity of the firm or both the liquidity and the asset holdings of the firm. For example, if the firm is embarked on a program of plant expansion and plans to use some of its present cash or marketable securities to finance the expansion, then the completion of the building program will reduce liquidity but not total assets. If, however, the firm faces a contract renegotiation with the possibility that it may have to relinquish some of its funds, the firm may lose cash without obtaining any other asset to offset it. If the management of the firm has plans for or is worried about losing some of its liquid assets, obviously it cannot distribute them as cash dividends. This is what the appropriated surplus accounts are supposed to show.

The question arises whether the existence of the appropriated surplus accounts means that the rest of the surplus – the unappropriated retained earnings – is available, for dividends. Unfortunately the answer is no. The unappropriated earned surplus may have accumulated over the years, and the funds it represents may have long since gone into physical plant, inventory, or other operating assets. Although legally possible, it may not be financially possible to payout any large percentage of the "free" surplus without crippling the operations of the company. As long as the company maintains the level of its operations, for all practical purposes the retained earnings may be as permanently committed to the business as the rest of the capital accounts. In fact, cash is the source of dividends or stock buy backs, not the surplus account.

4. BOOK VALUE OF COMMON STOCK

The book value of the common stock is not directly indicated on the balance sheet, but it is readily derived from the balance sheet data. The book value is the net asset value of a share of common stock as presented by accounting convention on the balance sheet. To obtain this figure we subtract the total liabilities from total assets shown on the balance sheet, subtract the voluntary liquidation value of the preferred stock plus any accumulated dividends, and divide the remainder by the number of common shares outstanding. Alternately, the book value per share equals the stated or par value of the common shares issued and outstanding, plus all the capital surplus, retained earnings, and surplus reserve accounts, less any liquidation premium or accrued dividends on the preferred shares, divided by the number of common shares outstanding. The book value of common stock did not warrant much analysis in the original Graham and Dodd (1934), but is a major component in the stock valuation analysis of Fama and French (1992) and Chen, Lakonishok and Hamao (1991).

Preferred stock is not included in book value either as a sum or as part of the divisor. If the term book value is used, it is usually understood as referring to the book value of the common stock, since the concept of book value of the preferred is not important or useful. Except in rare instances the preferred stockholders are not conceived of as having any ownership or interest in the surplus accounts; it is the common shares pro rata equity in the surplus account which lends meaning to the concept of book value.

Calculating and understanding the concept of book value is not difficult; it shows the net equity per share of the common stock. The book value of a share of stock, however, reflects only the information, which is given formally by the accounting data on the balance sheet. Although book value has some significance in indicating the worth of a share, it cannot give the earning power per share of stock, its market value, its value for control; or its probable future value. Book value is only one of many financial benchmarks.

If a company owns a minor part of another firm, it can be represented by a Minority Interest item. The book value of the subsidiary company's minority stock (i.e., those shares of stock the patent company does not own) will be placed on the balance sheet midway between the liability and capital sections, since this account, usually entitled interest of minority shareholders in consolidated subsidiaries, is somewhat of a hybrid.

The reader has been introduced to the component accounts of the firm's assets, total liabilities, and equity capital. A simple numerical example illustrates the accounts in a balance sheet.

<u>Current Assets</u>		<u>Current Liabilities</u>	
Cash	25	Accounts Payable	115
Marketable Securities	75	Short-Term Debt	160
Inventory	150	Total Current Liabilities	175
Total Current Assets	250	Long-Term Debt	525
Net Fixed Assets	750	Stockholder Equity	300
Total Assets	1000	Total Liabilities and Equity	1000

The simple firm has assets of $1000 (or $100 MM, if the reader prefers to think of larger numbers). The firm has current assets, cash, marketable securities, and inventory, of $250. The firm's current assets exceed its current liabilities, such as the immediate obligations of the firm could be paid, if payment would be requested, and its current assets, including inventory, could be liquidated at its book value. The bulk of the firm's assets are its net fixed assets, property, plant, and equipment, net of accumulated depreciation. One can think of the firm's fixed assets as including the factory where products are produced. The life of the fixed assets greatly exceeds the life of current assets, which is one year. Most firms with substantial fixed assets, as a percent of total assets, will seek to finance these assets by issuing long-term liabilities. The matching of asset and liability lives is often extremely important, particularly if the firm's creditors demand immediate payment. Management of the simple firm has issued debt of $525, and contributed (only) $300 of equity. That is, the firm has secured financing of its longer-lived assets by issuing debt (bonds, with a fixed maturity, or repayment date), than by issuing stock. Management maintains control of the firm's assets and profitability, as long as interest is paid on its debt and debt principle can be re-paid. The concept of debt and equity financing is addressed in Chapter 10. In the world of business, the management of many firms prefer to use debt financing, rather than equity financing, to pay for expansion of the firms' assets. Rates of return on equity investment are normally higher when the firm finances its asset growth using debt capital.

There are over 25 million firms in the US economy, as the reader will remember from Chapter 2. The reader can find balance sheet information from many sources in the business world. Public libraries normally carry the Standard & Poor's *Stock Market Guide* or its *Stock Reports*, the Value Line *Investment Survey*, or Mergent's (formerly Moody's) *Industrial Manual*, which contain balance sheet information on as many as 3000 firms. In order that the reader may follow the discussion more readily, this chapter illustrates the debt and equity financing of assets with the presentation of the balance sheets of three large corporations: International Business Machines (IBM), one of the world's largest computer and software firms, DuPont (DD), the largest chemical firm in the US, and Dominion Resources (D), the holding company for Virginia Electric & Power Company, VEPCO, a utility firm. IBM is predominately a hardware provider, although services and software are increasing as a percent of IBM sales. Software and services account for the majority of IBM operating profits. DuPont, in addition to its chemical business, has a substantial coatings and polymers business. VEPCO, an electric utility firm, provides electric power for Virginia, and to a lesser area, North Carolina. We show balances sheets for these firms in Tables 1–3, respectively, for the 2000-2004 period. These balance sheets can be found on an on-line source, AOL Personal Finance Research. We also show a modified set of balance sheet ratios for the three companies in Tables 3–6 for selected years during the 1950-2004 period, drawing data from the Wharton Data Research Services (WRDS) Compustat database.

This chapter is only a brief guide to the balance sheet. It is not intended to be an exhaustive study of accounting techniques. Balance sheets vary for different companies and types of industries. The title of the accounts and even the order in which they are presented may differ from what has been presented here. You should now, however, be able to understand any standard balance sheet presentation. Let us now turn to Tables 1 and 2 and the examples of IBM and DuPont.

IBM and DuPont provide very interesting examples of balance sheets during the 2000-2004 period, as shown in Tables 1 and 2. IBM is an advanced technology firm. As of December 31, 2004, IBM had current liabilities of $38.80 billion, long-term debt of $14.33 billion, and stockholder equity of $28.75 billion. IBM is a relative debt-intensive company; that is, IBM has a total debt-to-assets ratio of 0.500, whereas the technology sector average is 0.497. IBM has maintained a large total debt-to-equity ratio for a very long time, certainly during much of the 1950-1990 period. DuPont, a large chemical firm, has traditionally been an equity-intensive firm. As of December 31, 2004, DuPont had current liabilities of $7.34 billion, long-term debt of $5.55 billion, and stockholder equity of $11.14 billion. The total debt-to-total assets ratio of DuPont is 0.378, whereas the industry average is 0.497. IBM exceeds its sector average debt-to-assets ratio in 2004, whereas DuPont is lower than its corresponding sector average in 2004. DuPont had no long-term debt prior to 1964, and very little until 1981, when it acquired Conoco, as we will see in Chapter 18.

The reader may be concerned with an emphasis on manufacturing, or industrial firms. We illustrate the balance sheet of Dominion Resources, D, a diversified utility holding company principally in Virginia in Table 3. Dominion Resources has a total debt-total assets ratio of 0.518, higher than its sector average of 0.451. Larger debt ratios imply greater risk in our economy, as we will see in Chapter 10. The tables 1–3 of IBM, DuPont, and Dominion are taken from America Online (AOL) Personal Finance, Research, and Stock Reports. The data on AOL is normally five-years of data, known at a particular point in time. The S&P *Sock Guide* reports 10 years of data for a firms, as the data is known at a particular point in time, as we see in Table 4 for IBM. The data of these three corporations can be found on the Wharton Research Data Services (WRDS) database. The WRDS data is as-reported data, not restated for a particular time, as is often the case with financial data; restated data makes the history of a particular firm consistent over time for events such as a merger. The investor can make rational financial decisions when he uses data known at that moment in time. Events, such as mergers and divestments, can create vastly different pictures of the firm. We show the ratio of current assets-to-total assets (CATA), current liabilities-to-total assets (CLTA), total debt-to-total assets (TDTA), defined as current liabilities plus long-term debt, and stockholder equity-to-total assets (SEQTA) for selected years during the 1950-2003 period for the three firms in Tables 5–7.[11] The reader sees the vast differences among IBM, DuPont, and Dominion Resources with respect to their respective capital structures. The stockholder equity-to-total assets ratios are very different for the three firms; Dominion Resources has a smaller stockholder equity to total assets ratio relative to the corresponding IBM and DuPont ratios during much of the period. It is interesting that the three firms have very similar stockholder equity to total assets ratios in 2003. Dominion Resources has used far more long term debt, relative to its current liabilities, than IBM or DuPont, to finance its assets. The greater use of long term debt may produce greater interest expenses and lower profitability for Dominion Resources, as we will see in Chapters 4 and 5.

The corporate balance sheet allows the reader and investor to view the firm at a particular point in time. The reader sees the composition of the firm's capital structure, as well as the composition of current and fixed assets. Management's decisions on capital investment, dividend policy, and reliance on external financing can alter the presentation of corporate balance sheets and several financial ratios that many investors calculate to assess the firm's financial health over time.

Table 1. Annual Balance Sheet
IBM

Assets	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Cash and ST Investments	10,570.00	7,647.00	5,975.00	6,393.00	3,722.00
Receivables (Net)	28,136.00	28,923.00	27,358.00	27,018.00	30,726.00
Total Inventories	3,316.00	2,942.00	3,148.00	4,304.00	4,765.00
Raw Materials	2,137.00	1,950.00	2,188.00	3,045.00	3,319.00
Work in Progress	0.00	0.00	0.00	0.00	0.00
Finished Goods	1,179.00	992.00	960.00	1,259.00	1,446.00
Progress Payments & Other	0.00	0.00	0.00	0.00	0.00
Prepaid Expenses	0.00	2,608.00	2,379.00	0.00	0.00
Other Current Assets	4,948.00	2,542.00	2,792.00	4,746.00	4,667.00
Current Assets – Total	46,970.00	44,662.00	41,652.00	42,461.00	43,880.00
Long Term Receivables	10,950.00	11,099.00	5,291.00	5,424.00	5,712.00
Investment in Unconsol Subsidiaries	550.00	560.00	562.00	544.00	629.00
Other Investments	624.00	1,131.00	7,635.00	7,520.00	8,676.00

(Continued)

Tables 1–3 reprinted with permission from Thomson Financial website; AOL Personal Finance for IBM, DuPont, Dominion Resources.

Table 1. (Continued)

Assets	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Property, Plant & Equipment - Net	15,175.00	14,689.00	14,440.00	16,504.00	16,714.00
Property, Plant & Equipment – Gross	36,385.00	37,122.00	36,083.00	38,375.00	38,455.00
Accumulated Depreciation	21,210.00	22,433.00	21,643.00	21,871.00	21,741.00
Other Assets	31,890.00	28,028.00	22,590.00	13,465.00	9,770.00
Deferred Charges	20,966.00	18,814.00	16,003.00	9,407.00	6,806.00
Tangible Other Assets	698.00	569.00	1,076.00	1,817.00	1,334.00
Intangible Other Assets	10,226.00	8,645.00	5,511.00	2,241.00	1,630.00
Total Assets	**106,159.00**	**100,169.00**	**92,170.00**	**85,918.00**	**85,381.00**
Liabilities & Shareholders' Equity					
Accounts Payable	9,444.00	8,460.00	7,630.00	7,047.00	8,192.00
ST Debt & Current Portion of LT Debt	8,099.00	6,646.00	6,031.00	11,188.00	10,205.00
Accrued Payroll	3,804.00	3,671.00	3,724.00	3,796.00	3,801.00
Income Taxes Payable	4,728.00	5,475.00	5,476.00	4,644.00	4,827.00
Dividends Payable	0.00	0.00	0.00	0.00	0.00
Other Current Liabilities	13,723.00	13,371.00	11,359.00	8,444.00	9,381.00
Current Liabilities – Total	39,798.00	37,623.00	34,220.00	35,119.00	36,406.00
Long Term Debt	14,828.00	16,986.00	19,986.00	15,963.00	18,371.00
Provision for Risks and Charges	16,445.00	14,830.00	13,787.00	8,752.00	7,713.00
Deferred Income	2,222.00	1,842.00	1,409.00	1,145.00	1,266.00
Deferred Taxes	(1,145.00)	(2,454.00)	(2,864.00)	(802.00)	(1,345.00)
Deferred Tax Liability in Untaxed Reserves	0.00	0.00	0.00	0.00	0.00
Other Liabilities	4,264.00	3,478.00	2,850.00	2,127.00	2,346.00
Total Liabilities	**76,412.00**	**72,305.00**	**69,388.00**	**62,304.00**	**64,757.00**
Non-Equity Reserves	0.00	0.00	0.00	0.00	0.00
Minority Interest	0.00	0.00	0.00	0.00	0.00
Preferred Stock	0.00	0.00	0.00	0.00	247.00
Common Equity	29,747.00	27,864.00	22,782.00	23,614.00	20,377.00
Common Stock	393.00	387.00	384.00	383.00	378.00
Capital Surplus	17,962.00	15,882.00	14,474.00	13,865.00	12,022.00
Revaluation Reserves	0.00	0.00	0.00	0.00	0.00
Other Appropriated Reserves	(4,519.00)	(3,453.00)	(3,291.00)	(360.00)	(1,712.00)
Unappropriated (Free) Reserves	0.00	0.00	0.00	0.00	0.00
Retained Earnings	44,525.00	37,525.00	31,555.00	30,142.00	23,784.00
Equity in Untaxed Reserves	0.00	0.00	0.00	0.00	0.00

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
ESOP Guarantees	0.00	0.00	0.00	0.00	0.00
Unrealized Foreign Exchange Gain(Loss)	2,408.00	1,552.00	238.00	(612.00)	(217.00)
Unrealized Gain(Loss) on Marketable Securities	50.00	5.00	(365.00)	310.00	(78.00)
Treasury Stock	31,072.00	24,034.00	20,213.00	20,114.00	13,800.00
Total Liabilities & Shareholders Equity	**106,159.00**	**100,169.00**	**92,170.00**	**85,918.00**	**85,381.00**
Common Shares Outstanding (th)	1,645,592.45	1,694,508.64	1,722,366.90	1,723,193.73	1,762,899.18
in millions of USD					

Table 2. Annual Balance Sheet
DU PONT DE NEMOURS (DD)

Assets	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Cash and ST Investments	3,536.00	3,298.00	4,143.00	5,848.00	1,617.00
Receivables (Net)	5,284.00	4,496.00	3,884.00	3,903.00	4,552.00
Total Inventories	4,489.00	4,107.00	4,409.00	4,215.00	4,658.00
Raw Materials	743.00	767.00	880.00	844.00	907.00
Work in Progress	1,355.00	1,241.00	1,239.00	1,185.00	1,504.00
Finished Goods	2,773.00	2,401.00	2,734.00	2,652.00	2,818.00
Progress Payments & Other	(382.00)	(302.00)	(444.00)	(466.00)	(571.00)
Prepaid Expenses	209.00	208.00	175.00	217.00	228.00
Other Current Assets	1,693.00	6,353.00	848.00	618.00	601.00
Current Assets - Total	15,211.00	18,462.00	13,459.00	14,801.00	11,656.00
Long Term Receivables	0.00	0.00	0.00	0.00	0.00
Investment in Unconsol Subsidiaries	1,034.00	1,304.00	2,047.00	2,201.00	2,206.00
Other Investments	106.00	141.00	143.00	0.00	215.00
Property, Plant & Equipment - Net	10,224.00	9,892.00	13,286.00	13,287.00	14,182.00
Property, Plant & Equipment - Gross	23,978.00	24,149.00	33,732.00	33,778.00	34,650.00
Accumulated Depreciation	13,754.00	14,257.00	20,446.00	20,491.00	20,468.00
Other Assets	7,824.00	6,186.00	5,245.00	9,717.00	10,705.00
Deferred Charges	2,522.00	927.00	551.00	2,454.00	1,843.00
Tangible Other Assets	372.00	334.00	418.00	366.00	497.00
Intangible Other Assets	4,930.00	4,925.00	4,276.00	6,897.00	8,365.00
Total Assets	**34,399.00**	**35,985.00**	**34,180.00**	**40,006.00**	**38,964.00**

(Continued)

Table 2. (Continued)

Liabilities & Shareholders' Equity	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Accounts Payable	2,753.00	2,412.00	2,727.00	2,219.00	2,731.00
ST Debt & Current Portion of LT Debt	936.00	5,914.00	1,185.00	1,464.00	3,247.00
Accrued Payroll	1,043.00	1,008.00	1,063.00	969.00	1,057.00
Income Taxes Payable	192.00	60.00	47.00	1,295.00	250.00
Dividends Payable	0.00	0.00	0.00	0.00	0.00
Other Current Liabilities	3,015.00	3,649.00	2,074.00	2,120.00	1,970.00
Current Liabilities - Total	7,939.00	13,043.00	7,096.00	8,067.00	9,255.00
Long Term Debt	5,548.00	4,301.00	5,647.00	5,350.00	6,658.00
Provision for Risks and Charges	6,038.00	6,756.00	7,701.00	6,222.00	5,376.00
Deferred Income	0.00	0.00	0.00	0.00	0.00
Deferred Taxes	(267.00)	(546.00)	1,181.00	2,377.00	1,643.00
Deferred Tax Liability in Untaxed Reserves	0.00	0.00	0.00	0.00	0.00
Other Liabilities	2,654.00	2,153.00	1,069.00	1,114.00	2,353.00
Total Liabilities	**21,912.00**	**25,707.00**	**22,694.00**	**23,130.00**	**25,285.00**
Non-Equity Reserves	0.00	0.00	0.00	0.00	0.00
Minority Interest	1,110.00	497.00	2,423.00	2,424.00	380.00
Preferred Stock	237.00	237.00	237.00	237.00	237.00
Common Equity	11,140.00	9,544.00	8,826.00	14,215.00	13,062.00
Common Stock	324.00	325.00	324.00	327.00	339.00
Capital Surplus	7,784.00	7,522.00	7,377.00	7,371.00	7,659.00
Revaluation Reserves	0.00	0.00	0.00	0.00	0.00
Other Appropriated Reserves	(621.00)	(1,866.00)	(2,724.00)	0.00	(176.00)
Unappropriated (Free) Reserves	0.00	0.00	0.00	(273.00)	0.00
Retained Earnings	10,182.00	10,185.00	10,619.00	13,517.00	12,153.00
Equity in Untaxed Reserves	0.00	0.00	0.00	0.00	0.00
ESOP Guarantees	0.00	0.00	0.00	0.00	174.00
Unrealized Foreign Exchange Gain(Loss)	192.00	106.00	(33.00)	0.00	(42.00)
Unrealized Gain(Loss) on Marketable Securities	6.00	(1.00)	(10.00)	0.00	30.00
Treasury Stock	6,727.00	6,727.00	6,727.00	6,727.00	6,727.00
Total Liabilities & Shareholders Equity	**34,399.00**	**35,985.00**	**34,180.00**	**40,006.00**	**38,964.00**
Common Shares Outstanding (th)	994,340.62	997,284.13	993,940.45	1,001,953.36	1,042,931.93

in millions of USD

Table 3. Annual Balance Sheet
DOMINION RESOURCES (D)

Assets	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Cash and ST Investments	389.00	126.00	374.00	730.00	635.00
Receivables (Net)	2,905.00	3,919.00	3,054.00	1,996.00	2,358.00
Total Inventories	893.00	870.00	637.00	577.00	327.00
Raw Materials	508.00	450.00	406.00	395.00	0.00
Work in Progress	0.00	0.00	0.00	0.00	0.00
Finished Goods	0.00	0.00	0.00	0.00	0.00
Progress Payments & Other	385.00	420.00	231.00	182.00	0.00
Prepaid Expenses	157.00	202.00	347.00	384.00	173.00
Other Current Assets	2,778.00	2,064.00	2,413.00	1,716.00	2,373.00
Current Assets - Total	7,122.00	7,181.00	6,825.00	5,403.00	5,866.00
Long Term Receivables	0.00	0.00	0.20	106.00	676.00
Investment in Unconsol Subsidiaries	387.00	437.00	503.00	490.00	392.00
Other Investments	3,486.00	2,650.00	2,671.00	2,564.00	1,534.00
Property, Plant & Equipment - Net	26,716.00	25,850.00	20,257.00	18,364.00	14,849.00
Property, Plant & Equipment - Gross	38,663.00	37,107.00	32,631.00	0.00	28,011.00
Accumulated Depreciation	11,947.00	11,257.00	12,374.00	0.00	13,162.00
Other Assets	7,485.00	7,841.00	7,652.80	7,442.00	5,849.00
Deferred Charges	2,195.00	2,274.00	1,710.24	1,511.00	1,789.00
Tangible Other Assets	594.00	911.00	1,328.56	1,404.00	558.00
Intangible Other Assets	4,696.00	4,656.00	4,614.00	4,527.00	3,502.00
Total Assets	**45,196.00**	**43,959.00**	**37,909.00**	**34,369.00**	**29,166.00**
Liabilities & Shareholders' Equity					
Accounts Payable	1,984.00	2,712.00	2,310.00	1,776.00	1,736.00
ST Debt & Current Portion of LT Debt	1,941.00	2,704.00	3,318.00	3,213.00	3,573.00
Accrued Payroll	0.00	0.00	0.00	180.00	127.00
Income Taxes Payable	0.00	0.00	0.00	144.00	316.00
Dividends Payable	0.00	0.00	0.00	0.00	0.00
Other Current Liabilities	4,131.00	3,451.00	2,815.00	2,165.00	1,840.00
Current Liabilities - Total	8,056.00	8,867.00	8,443.00	7,478.00	7,592.00
Long Term Debt	15,507.00	15,776.00	13,457.00	13,251.00	10,101.00
Provision for Risks and Charges	0.00	0.00	0.00	0.00	0.00
Deferred Income	0.00	0.00	0.00	0.00	0.00
Deferred Taxes	5,249.00	4,336.00	4,209.00	3,940.00	2,638.00
Deferred Tax Liability in Untaxed Reserves	0.00	0.00	0.00	0.00	0.00
Other Liabilities	4,701.00	4,185.00	1,330.00	948.00	948.00
Total Liabilities	**33,513.00**	**33,164.00**	**27,439.00**	**25,617.00**	**21,279.00**
Non-Equity Reserves	0.00	0.00	0.00	0.00	0.00
Minority Interest	0.00	0.00	0.00	0.00	1.00

(Continued)

Table 3. (Continued)

Liabilities & Shareholders' Equity	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Preferred Stock	257.00	257.00	257.00	384.00	894.00
Common Equity	11,426.00	10,538.00	10,213.00	8,368.00	6,992.00
Common Stock	10,888.00	10,052.00	9,051.00	7,129.00	5,979.00
Capital Surplus	92.00	61.00	47.00	28.00	16.00
Revaluation Reserves	0.00	0.00	0.00	0.00	0.00
Other Appropriated Reserves	(14.00)	(14.00)	(14.00)	289.00	(31.00)
Unappropriated (Free) Reserves	0.00	0.00	0.00	0.00	0.00
Retained Earnings	1,442.00	1,054.00	1,561.00	922.00	1,028.00
Equity in Untaxed Reserves	0.00	0.00	0.00	0.00	0.00
ESOP Guarantees	0.00	0.00	0.00	0.00	0.00
Unrealized Foreign Exchange Gain(Loss)	(1,131.00)	(704.00)	(4.00)	0.00	0.00
Unrealized Gain(Loss) on Marketable Securities	149.00	89.00	(428.00)	0.00	0.00
Treasury Stock	0.00	0.00	0.00	0.00	0.00
Total Liabilities & Shareholders Equity	**45,196.00**	**43,959.00**	**37,909.00**	**34,369.00**	**29,166.00**
Common Shares Outstanding (th)	340,000.00	325,000.00	308,000.00	264,700.00	245,800.00

Table 4. S&P Stock

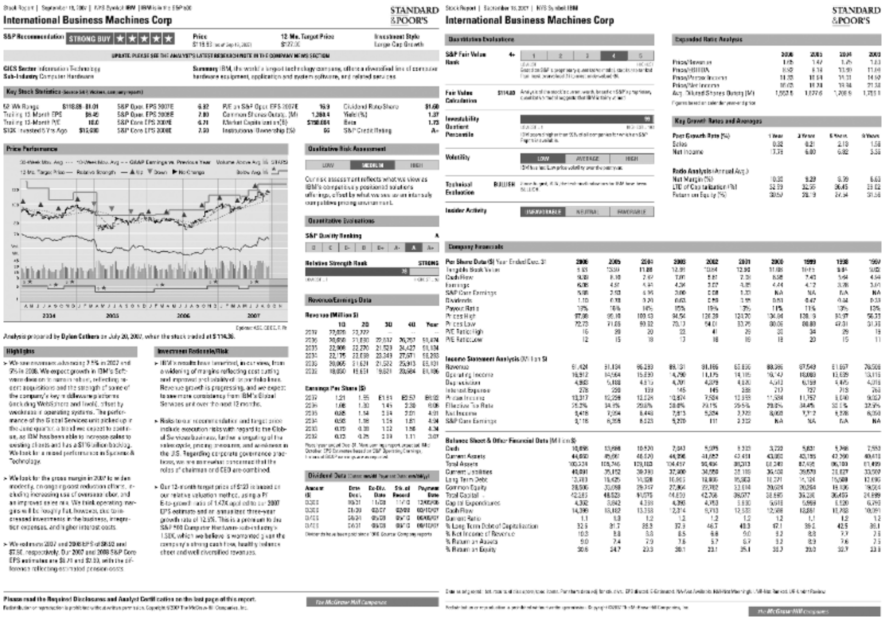

Table 5. IBM
WRDS Database, Selected Years, 1950-2004

Year	CATA	CLTA	TDTA	SEQTA
1963	47.8%	15.0%	32.9%	67.1%
1970	39.9	21.9	28.7	69.6
1980	37.2	24.5	32.3	61.7
1985	49.6	21.7	29.2	60.8
1990	44.4	28.8	42.5	48.9
1995	50.6	39.4	52.0	27.8
2000	49.9	41.2	62.0	23.1
2001	48.1	39.8	57.8	26.7
2002	43.2	35.8	56.5	23.6
2004	43.0	36.5	50.0	27.3

Where current assets-to-total assets (CATA);
current liabilities-to-total assets (CLTA);
total debt-to-total assets (TDTA);
and stockholder equity-to-total assets (SEQTA).

Table 6: DuPont

WRDS Database, Selected Years, 1950-2004

Year	CATA	CLTA	TDTA	SEQTA
1962	34.8	6.4	6.4	81.4
1970	42.7	11.9	16.4	71.5
1980	47.0	20.2	31.7	57.0
1985	38.3	21.1	34.1	49.4
1990	32.1	28.2	41.1	42.4
1995	29.4	34.1	49.3	21.9
2000	29.6	23.5	40.4	33.1
2001	36.7	20.0	33.3	35.3
2002	38.8	20.5	36.8	25.5
2004	42.7	22.3	37.9	31.2

Where current assets-to-total assets (CATA);
current liabilities-to-total assets (CLTA);
total debt-to-total assets (TDTA);
and stockholder equity-to-total assets (SEQTA).

Table 7. Dominion Resources

WRDS Database, Selected Years, 1950-2004

Year	CATA	CLTA	TDTA	SEQTA
1963	4.9	4.8	52.0	31.9
1970	4.0	6.0	56.9	31.5
1980	7.9	8.5	53.0	28.7
1985	8.5	12.8	46.5	31.6
1990	7.1	8.5	48.5	33.0
1995	7.9	10.0	44.2	34.1
2000	20.0	25.9	61.6	23.8
2001	15.6	21.8	60.3	24.4
2002	18.0	22.3	57.8	26.9
2004	15.7	17.7	51.8	25.1

Where current assets-to-total assets (CATA);
current liabilities-to-total assets (CLTA);
total debt-to-total assets (TDTA);
and stockholder equity-to-total assets (SEQTA).

Notes

[1]Essentially unrealized profits are ignored but unrealized losses affect the accounting results.

[2]White, Sondhi, and Fried (1998), pp.274- 275.

[3]White, Sondhi, and Fried (1998), pp.289-290.

[4]This constitutes "historical cost depreciation" in contrast to, say, "replacement cost depreciation," where allowance might be made for changes in current costs.

[5]On the other hand, a fall in price levels would enable a firm to increase its physical capacity through the reinvestment of depreciation allowances.

[6]Sloan (1996) and Richardson, Sloan, Soliman, and Tuna (2001) have shown that accrual's provide information about earnings' quality. Inventory accruals, the primary source of asset accruals, and accounts payables, the primary source of liability accruals, convey information. Richardson, Sloan, Soliman, and Tuna (2001) showed that the setting of accruals, asset accruals less liability accruals, is an important source of financial information. Nondiscretionary accruals, accruals associated with sales growth and the level of firm operating activities, conveys information regarding earnings quality. Accrual information influences information attributable to efficiency. Sloan uses FASB 95 to define accruals as the difference between net income and cash flows form operating activities. Sloan (1996) found that stocks with extreme accruals have less persistent earnings and experience mean reversion in next year's earnings.

[7]This matter is taken up again in Chapter 9 on Bonds.

[8]They may be called the proprietorship account in a single proprietorship or the partner's equity in a partnership.

[9]In bank balance sheets the equivalent to the unappropriated earned surplus account is entitled undivided profits. The bank's surplus account consists of capital surplus plus the retained earnings that are considered permanently committed to the business.

[10]To add to the beginner's confusion, current operating losses are often called operating deficits, or just deficits.

[11]Because we use current liabilities and long-term debt in the TDTA calculation, and not total liabilities, the TDTA and SEQTA may not sum to 100%. Current liabilities and long-term debt represent the vast majority of total liabilities.

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PROBLEM

Look up the balance sheet of Microsoft and DuPont in the investment manuals (Mergent's *Industrial Manual* and/or Standard and Poor's *Stock Guide*) and secure the company's latest annual report.

a. What is the company's total current assets, net fixed assets, other assets?
b. What is the total equity of the corporation?
c. What is the book value of a share of its common stock?
d. What is the firm's total debt-to-total assets ratio?
e. What is the firm's stockholder equity-to-total assets ratio?

Can you make comparisons with the Microsoft and DuPont industry and S&P 500 comparisons?

Chapter 4

THE OPERATING STATEMENTS: THE INCOME STATEMENT AND ANNUAL CASH FLOW STATEMENT

The balance sheet of a company and the income statement are related. The balance sheet is an accounting snapshot at a point of time. The income, profit and loss, or operating statement is a condensation of the firm's operating experiences over a given period of time.[1] It depicts certain changes that have occurred between the last balance sheet and the present one. The balance sheet (position statement) and the income statement may be reconciled through the earned surplus account. If this reconciliation is presented formally, it becomes the surplus statement.

The income statement is very important. The balance sheet depicts how much assets historically have been invested in a firm; the operating statement indicates how successful (whether by efficiency, daring, or chance) the company has been in making a return on the assets committed to it.

1. FORM AND CONTENT OF THE INCOME STATEMENT

The operating statement takes different forms, depending on the intended audience. The detailed breakdown made for the operating management is usually not presented in the annual report to the general stockholders. Furthermore, the format and the order of items on the report differ according to the tastes and traditions of the managements of different firms.

Financial services that gather data on corporations for the investment community use a similar format for all firms to make it easy to compare companies. The form used by the services breaks out most of the important variables that are interesting for investment analysis. For example, a company's annual report will often lose the depreciation charges in a lumped account such as "manufacturing costs" or "costs of goods sold," and the actual depreciation charges can be obtained only in a footnote or in an obscure part of the report. The financial services show the depreciation charges as a separate item.

Tables 1–9 reprinted with permission from Thomson Financial website; AOL Personal Finance for IBM, DuPont, Dominion Resources.

The following discussion explains the major items appearing in the suggested statement and gives something of their significance.

1. *Sales or Revenues*. The sales account shows the total gross revenue received by the firm during the period. It includes sales for cash and for credit, whether or not they were collected at the end of the period. The sales figure should be net of allowances made to the buyers for spoiled or poor quality goods or returned shipments.

2. *Direct Operating Cost*. The direct operating costs are the amounts spent for material, labor on the goods sold, plus the other costs expended during the period such as selling, administrative, and advertising costs. Items such as the expense for fuel, power, light, local taxes other than those on income, and telephone charges are included in this figure. Although under certain circumstances it is helpful to have separate figures on the cost of goods sold and other costs, this breakdown is generally interesting only to the operating management. The direct operating costs do not in any case include such non-cash charges as the depreciation of fixed assets, depletion, or the amortization of franchises or patents.

3. *Regular Nonoperating Income.* This account includes interest income, dividends on investments, and similar items. Income from major subsidiaries should be consolidated on the reported income statement, even if this is not done for tax purposes. Thus this account does not include the dividends from dominated subsidiary companies. Irregular income, such as that which might occur from the sale of an operating asset at a profit, are presented near the foot of the statement after the results of regular operations are reported.

4. *Earnings before Depreciation, Interest, and Taxes.* This figure represents the gross return on the company's operation. It is the amount by which the revenues exceed the "variable" costs, or costs of goods sold. Out of this sum come the funds to satisfy various claimants to a return from the firm, and internal funds that can be used to reduce debt or buy new assets according to the company's position after fixed claims are met and the distribution to the owners is decided.

5. *Depreciation (and Other Noncash Charges)*. Noncash charges are such items as depletion, depreciation, or amortization of franchises, patents, etc. (These have been discussed in Chapter 3) Depreciation is usually by far the most important of these items.

The-depreciation account is the estimated capital (i.e., fixed assets) used up during the year. The depreciation charge is based on the cost-not the present value-of the assets and the schedule of depreciation charges on an asset once set initially cannot be varied except under special circumstances. The level of depreciation charges is important in setting the amount of corporation profit tax due. It is important in reminding the management that not all the returns coming in are income, some must be considered a return of capital, and dividends policies should be set accordingly.

The annual depreciation charges do not, however, set the amount of fixed assets that will be replaced or new fixed assets purchased. This decision is based on the forecasted future profitability of the replacement or of the new assets, as the reader will see in Chapter 11. If investment in new fixed assets appear to generate an acceptable rate of return, then available internal funds or other sources of funds will be found. If capital expenditures exceed internally-generated cash flows, then new debt or equity must be raised to finance the investment. If the new investment in fixed assets does not exceed the amount of depreciation, then the extra funds can be used for something else,[2] such as retiring long-term debt, repurchasing equity, or paying larger dividends.

6. *Earnings before Interest and Taxes (EBIT)*. The EBIT represents the income of the firm after the book charge for depreciation has been made. After this figure is determined, the effect of many past financial decisions comes into play. The amount of interest that will be paid is based on the amount of interest-bearing debt the firm has incurred, and this influences the profits tax. The amount available for the common stockholders is obtained after dividends on the preferred stock is subtracted. These figures are influenced by decisions on alternate methods of financing the firm. The pros and cons of these decisions make up a large part of the subject of corporation finance.

7. *Interest.* This item represents the interest paid by the company on debt. It is reduced by the amortization of any premium on bonds payable, and increased by the amortization of bond discounts. Interest expense is deductible before calculating the corporation income tax.

8. *Corporation Profits Tax.* The current corporate income tax schedule for tax years beginning after December 31, 1992, is

Taxable Income	Tax Rate	Minus \$ = \$ Tax
\$0 - \$50,000	15%	Minus \$0 = \$ Tax
\$50,001 - \$75,000	25%	Minus \$5,000 = \$ Tax
\$75,001-\$100,000	34%	Minus \$11,750 = \$ Tax
\$100,001-\$335,300	38%	Minus \$16,750 = \$ Tax
\$335,301-\$10,000,000	34%	Minus \$0 = \$ Tax
\$10,000,001-\$15,000,000	35%	Minus \$100,000 = \$ Tax
\$15,000,001-\$18,333,333	38%	Minus \$550,000 = \$ Tax
> \$18,333,334	35%	Minus \$0 = \$ Tax

Source: Small Business, Quickfinder Handbook. www.quickfinder.com

9. *Earnings After Taxes*. The earnings after taxes as depicted on our model statement is the amount earned on the total equity of the corporation from regular sources. It is not the dividends paid on the owners' investment nor is it the amount earned on the common stock equity.

10 and 11. *Nonrecurring Losses or Gains (after taxes).* Nonrecurring losses or gains arise out of transactions such as the sale of fixed assets (buildings, land, or equipment), often associated with discontinued operations or the sale of subsidiaries or investments in securities. Losses can also occur because of natural disasters (floods or fires) or because of liabilities on lawsuits. In any case these gains or losses do not arise out of the normal operations of the business. These items are given separately because they are special or nonrecurring. If a firm sells a plant or subsidiary at a profit, the earnings for a given year are raised, but the earnings generated by the subsidiary will no longer be available in the future. The tax on nonrecurring gains will probably not be at the regular 35 percent rate, for if the transaction is classified as a capital gain the maximum rate is 28 percent. Whether or not nonrecurring losses are fully deductible for tax purposes depends on the circumstances. It is suggested that when nonrecurring gains or losses occur, they be entered net of taxes (a loss would be reduced if there were regular income tax which could be used as an offset) after the regular part of the income report. Details should be provided in footnotes. In our illustrative statement, there are no nonrecurrent items.

12. *Dividends on Preferred Shares*. The dividends declared on the preferred shares are subtracted from net profits to obtain the earnings available to the common. Although the preferred dividends are not a legally fixed obligation of the firm, they represent a claim senior to any return on common shares, and there can be no calculation of earnings on the common shareholders' investment until they are accounted for. The preferred dividends are a prior charge from the view of the true residual owners of the firm – the common shareholders. Any accrued passed preferred dividends should be cited in a footnote to the statement.[3]

13. *Earnings Available to Common Stock.* This amount represents the accounting profit or earnings accruing to the shareholders of the business after all prior deductions have been made. The term "accounting profits or earnings" is used deliberately. The accounting profits and the "true" or "economic" profits of the firm can differ considerably. (Economic profits is the amount which remains after all imputed costs – such as interest on all the funds employed no matter what the source – are subtracted.) However, the economists differ on their definition of economic profits, and none of these

definitions are easily implemented in practice. Thus the reported accounting profits serve as a useful available measure of the firm's success. Most stock valuation models, such as those presented in Chapters 8 and 14, rely upon reported earnings. Moreover, under the discipline of the accounting formalities, profits are reported on a sufficiently consistent basis to enable them to be used in the determination of important legal obligations and privileges. But even within the accounting rules there exist legitimate alternative methods of reporting certain expenses and charges, which can cause considerable variation in the operating results of any year.[4]

14. *Dividends on Common Stock.* Dividends are shown here as a charge on earnings. In most jurisdictions, however, legally they constitute a charge against surplus, not current earnings, and may be declared as long as there is a sufficient credit balance in the surplus account, even if there are no current profits. Firms may elect to do this. As a practical matter, however, the dividend policies of most firms are conditioned by their current earnings position and not by their retained surplus account, and so from the point of view of functional relationships the order of accounting presented seems quite correct.[5] Common stock dividends are a voluntary distribution of the profits of the firm and not a legal obligation. Their declaration does not reduce the profits of the firm. Thus they are deducted after the earnings on the common are calculated. Moreover, the profits tax liability of the firm is not affected by either the payment of preferred dividends or common dividends.

15. *Addition to Retained Earnings for the Year.* What is left after all dividends are subtracted from the reported profits are the retained earnings, reinvested earnings, or net addition to surplus, for the year. (If expenses exceed revenues, there would be instead an operating loss or deficit for the year.) The retained earnings for the period depend on the level of profit and the dividend policy of the company. These in turn are influenced by factors such as the stability and amount of the company's cash flow, the firm's growth prospects, and its need for equity funds either to acquire additional assets or to repay debt.

The retained earnings accumulated over time become the retained earnings of the firm. But, as the reader saw in Chapter 3, this account indicates only a historical source for the financing of the firm and does not represent an existing fund of cash.

16. *Earnings per Share and Cash Flow Per Share.* The amount earned and paid in dividends on the individual stockholder's share is of more direct importance to him than the total amount earned by the firm. The earnings and trend of dividends on the individual shares in the long run establish their value in the market.

The earnings per share are obtained by dividing the total earnings available to the common stock by the number of shares of stock outstanding. Often the earnings per share are shown once, reflecting the regular, recurring income, and again, including extraordinary income items. An additional figure, not always available but often useful, is the cash flow per share. It includes earnings available to the common shareholders plus noncash charges divided by the number of shares. This figure shows the gross funds available per share of stock which may be used to repay debt, acquire assets, and pay dividends. An interesting possibility is to subtract required amortization of debt from the cash flow per share and arrive at the figure of "free" or "disposable" cash flow per share. This figure might prove useful in comparing two firms where earnings are similar but one firm is required to make payments on the principal of its debt.

A simple income statement (in $MM) illustrates its components, as was done for the balance sheet in Chapter 3.

Sales	$722.5
- Cost of Goods Sold	470.0
- Depreciation	95.0
Gross Income	157.5
-General, Selling Expenses	72.5
EBIT	85.0
- Interest Paid	40.0
Earnings Before Taxes	45.0
-Taxes	15.8
Earnings After Taxes	29.2

The firm produced sales of $722.5 million by selling its products, and after subtracting its cost of goods sold and depreciation and amortization charges, gross income of $157.5 million is produced. One subtracts general, selling, and administrative expense from gross income, to create Earnings before Interest and Taxes, EBIT ($85.0 MM for the simple firm). Interest expenses of $40 million must be paid to the firm's bondholders, such that Earnings before Taxes are $45 million. The firm pays taxes of $15.8 million, leaving Earnings after Taxes, or Net Income, of $29.2 million. A net income figure may not as useful to an investor unless net income is represented as a percent of sales, total assets, or equity. The ratio of net income relative to its total assets, referred to as a firm's ROA, or return on assets, allows the investor to compare the profitability of the firm relative to all firms, or firms within a industry or sector.[6] Comparisons can be made regarding net income relative to a firm's sales, or return on sales, ROS, and equity, referred to as the return on equity, ROE. One prefers to see higher values of ROA, ROS, and ROE.

Income statements can be found for investors and researchers. A source of the most recent five years of income statement data can be found on AOL Personal Finance, Stock Research. Table 1 is a modified income statement for IBM, for the 2000-2004 period, which might be highly useful for various financial analyses. Similar income statements for DuPont and Dominion Resources are shown in Tables 2 and 3. They differ only in slight details from that used by the investors' services; however, it gives a finer breakdown of certain charges and presents separate figures for many of the intermediate steps. Many of these items make for easier understanding of the firm's operating results and are useful to investors, creditors, or scholars in comparing companies. Some companies may prefer not to publicize these details; on the other hand, these items are usually presented in sources such as the prospectus drawn up for the Securities Exchange Commission when new securities are issued.

The as-reported, "bottom line" net income data for the three firms is shown relative to the firm's total assets (ROA), sales (ROS), and equity (ROE) for selected years during the 1950-2004 period in Tables 4–6. The ROA ratio illustrates the effective use of the firm's assets. That is, a higher ROA for the firm relative to a set of comparable firms, its industry or sector, shows that the firm's assets are employed to generate higher net income and a more effective use of assets. A higher relative ROS indicates that for a given sales volume, the firm generates higher net income than comparable firms. The ROE ratio helps quantify the firm's profitability relative to its use of leverage. Chapter 5 makes extensive use of the ROA, ROS, and ROE ratios.

2. RETAINED EARNINGS VS. DIVIDENDS

Corporate profits in the year earned are taxed by the federal government at a rate going up to 35 per cent; and any distribution of dividends are taxed as additional income to the recipient at the appropriate personal income tax bracket rate.[7] Moreover gains from retained earnings which may result in shareholders capital gains are also eventually taxed. This is what constitutes the "double taxation of corporation income." The disparity between the corporation profits rate and the personal income tax rate, and the fact that they are applied separately, impacts most heavily on lower income shareholders and investors in retirement funds.

3. ANNUAL CASH FLOW STATEMENT

The income statement provides a picture of the firm's operations during the past year. The "bottom line" of the income statement is the firm's net income or after-tax profits. The firm's sources of cash flow from its operations are positive net income, having depreciation and other non-cash expenses, net decreases in its current assets and net increases in its current liabilities (funds from operating activities), decreases in its long-tern (fixed) assets (funds from investing), and issuing new debt or equity (funds from financing),. The firm uses its cash flow to pay dividends, engage in capital expenditures, pursue research and development (R&D) expenditures repurchase debt and equity, decrease its current liabilities, or increase its current and / or fixed assets. The firm's sources of funds must equal its uses of funds.[8] Stockholders prefer to see its firms cash flow derived from profits, not depreciation, because depreciation is an expense that serves to provide the firm with cash flow to replenish its capital investment. Please note that in the year 2000, IBM produced $8.073 billion of net income, which was used to engage in capital expenditures of $5.616 billion and pay dividends of $909 million. IBM also had depreciation of $4.513 billion in 2000. In Table 7, one can see that IBM issued $9.504 billion of new debt, repurchased $7.581 billion of previously issued debt with presumably higher coupon rates of interest, and thus produced a net new debt addition of $1.9 billion in 2000. IBM ranked quite high (7780 of 7850 firms reported on Compustat) in debt issuance. IBM, as the reader saw in Chapter 3, is a debt-intensive firm. The use of debt provides a higher return to stockholders than using equity, when the firm's return on total assets exceeds the cost of debt. A firm can find itself in trouble with "excessive debt" when its return on assets fall below its cost of debt, as the reader will see in Chapter 10. IBM new debt issues have been positive in the 2000-2004 period, please see Table 7, whereas IBM has not issued stock. IBM has re-purchased more debt than it has issued during the 1999-2003 period. DuPont's cash flow has come from net income and depreciation, in most equal amounts during the 2000-2004 period, see Table 8. DuPont has re-purchased more debt than it has issued during the 2000-2004 period, and DuPont issued $924 million of equity, as contrasted with $23.7 billion of debt, Dominion Resources, see Tables 9, relied upon depreciation for the majority of its cash flow. In 2003, Dominion Resources issued $30.879 billion of debt, only $4.98 billion of equity, and repurchased $ 25.62 billion of debt. Table 10, summarizes sources and uses of funds for IBM, DuPont, and Dominion Resources during the 1998-2004 period.

IBM and DuPont were net repurchasers of debt and equity, primarily debt, whereas Dominion Resources was a net issuer of debt and equity, primarily debt. The 2000-2004 period was not an exception in the financing policies of the three firms. IBM and DuPont were net debt issuers and net equity re-purchasers during the 1971-2003 period Dominion Resources issued more net debt than net equity during the 1971-2004 period. We show the total net equity issues, defined as equity issued – equity re-purchased, net debt issued, defined as debt issued – debt re-purchased, and net dividends paid, defined as dividends paid – equity re-purchased in Table 11. Moreover, DuPont and Dominion Resources paid greater dividends than was the value of equity re-purchased.

Debt financing dominated the U.S. economy during the 1971-2004 period, as new debt issues amounted to $31 trillion, new equity issues only $3.7 trillion. Debt re-purchases totaled $23.4 trillion and equity re-purchases totaled $2.8 trillion. Thus, net new debt amounted to $8.1 trillion during the 1971-2004 period, whereas net new equity amounted to only $0.8 trillion. Dividends exceeded equity re-purchases by $3.2 trillion during the corresponding period.

The corporate income statement allows the reader and investor to view the firm's operating activities during the past year (or quarter). The reader sees the composition of the firm's revenues, and operating costs. The annual cash flow statement allows the reader or investor, to see how the firm generates its cash flow, and uses its cash flow. Ratios using several income statement items are calculated in Chapter 5.

Table 1. Annual Income Statement
INT'L BUSINESS MACHS (IBM)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Net Sales or Revenues	96,293.00	89,131.00	81,186.00	85,866.00	88,396.00
Cost of Goods Sold	55,852.00	51,880.00	47,026.00	49,264.00	50,977.00
Depreciation, Depletion & Amortization	4,915.00	4,701.00	4,379.00	4,820.00	4,995.00
Gross Income	**35,526.00**	**32,550.00**	**29,781.00**	**31,782.00**	**32,424.00**
Selling, General & Admin Expenses	23,899.00	22,037.00	20,838.00	22,487.00	20,790.00
Other Operating Expenses	0.00	0.00	0.00	0.00	0.00
Other Expenses - Total	84,666.00	78,618.00	72,243.00	76,571.00	76,762.00
Operating Income	11,627.00	10,513.00	8,943.00	9,295.00	11,634.00
Extraordinary Credit - Pretax	0.00	0.00	0.00	0.00	0.00
Extraordinary Charge - Pretax	672.00	513.00	2,413.00	405.00	0.00
Non-Operating Interest Income	180.00	152.00	127.00	178.00	310.00
Reserves - Inc(Dec)	0.00	0.00	0.00	0.00	0.00

(Continued)

Tables 1–3 reprinted with permission from Thomson Financial website; AOL Personal Finance for IBM, DuPont, Dominion Resources.

Table 1. (Continued)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Pretax Equity in Earnings	N/A	N/A	N/A	N/A	N/A
Other Income/Expenses - Net	1,032.00	867.00	1,012.00	2,123.00	307.00
Earnings Before Interest and Taxes (EBIT)	**12,167.00**	**11,019.00**	**7,669.00**	**11,191.00**	**12,251.00**
Interest Expense On Debt	143.00	160.00	180.00	271.00	737.00
Interest Capitalized	4.00	15.00	35.00	33.00	20.00
Pretax Income	12,028.00	10,874.00	7,524.00	10,953.00	11,534.00
Income Taxes	3,580.00	3,261.00	2,190.00	3,230.00	3,441.00
Current Domestic Income Taxes	(558.00)	280.00	471.00	410.00	805.00
Current Foreign Income Taxes	2,057.00	1,855.00	1,786.00	2,162.00	2,607.00
Deferred Domestic Income Taxes	1,933.00	522.00	0.00	496.00	333.00
Deferred Foreign Income Taxes	148.00	604.00	(67.00)	162.00	(304.00)
Income Tax Credits	0.00	0.00	0.00	0.00	0.00
Minority Interest	0.00	0.00	0.00	0.00	0.00
Equity in Earnings	N/A	N/A	N/A	N/A	N/A
After Tax Income/Expense	0.00	0.00	0.00	0.00	0.00
Discontinued Operations	(18.00)	0.00	0.00	0.00	0.00
Net Income Before Extra Items/Preferred Div	**8,430.00**	**7,613.00**	**5,334.00**	**7,723.00**	**8,093.00**
Extra Items & Gain(Loss) Sale of Assets	0.00	(30.00)	(1,755.00)	0.00	0.00
Net Income Before Preferred Dividends	8,430.00	7,583.00	3,579.00	7,723.00	8,093.00
Preferred Dividend Requirements	0.00	0.00	0.00	10.00	20.00
Net Income Available to Common	**8,430.00**	**7,613.00**	**5,334.00**	**7,713.00**	**8,073.00**

in millions of USD

Table 2. Annual Income Statement

DU PONT DE NEMOURS (DD)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Net Sales or Revenues	27,340.00	26,996.00	24,006.00	24,726.00	28,268.00
Cost of Goods Sold	19,292.00	19,398.00	16,296.00	16,587.00	18,062.00
Depreciation, Depletion & Amortization	1,347.00	1,584.00	1,515.00	1,754.00	1,860.00
Gross Income	**6,701.00**	**6,014.00**	**6,195.00**	**6,385.00**	**8,346.00**
Selling, General & Admin Expenses	4,474.00	4,344.00	3,963.00	4,653.00	4,962.00
Other Operating Expenses	0.00	0.00	0.00	0.00	0.00
Other Expenses - Total	25,113.00	25,326.00	21,774.00	22,994.00	24,884.00
Operating Income	2,227.00	1,670.00	2,232.00	1,732.00	3,384.00
Extraordinary Credit - Pretax	22.00	101.00	169.00	6,145.00	11.00
Extraordinary Charge - Pretax	1,100.00	1,993.00	437.00	1,087.00	443.00
Non-Operating Interest Income	188.00	70.00	97.00	146.00	168.00
Reserves - Inc(Dec)	0.00	0.00	0.00	0.00	0.00
Pretax Equity in Earnings	0.00	N/A	0.00	0.00	N/A
Other Income/Expenses - Net	506.00	632.00	365.00	541.00	819.00
Earnings Before Interest and Taxes (EBIT)	**1,843.00**	**480.00**	**2,426.00**	**7,477.00**	**3,939.00**
Interest Expense On Debt	379.00	376.00	383.00	652.00	879.00
Interest Capitalized	17.00	29.00	45.00	62.00	69.00
Pretax Income	1,481.00	133.00	2,088.00	6,887.00	3,129.00
Income Taxes	(329.00)	(930.00)	185.00	2,467.00	1,072.00
Current Domestic Income Taxes	85.00	13.00	(42.00)	1,504.00	516.00
Current Foreign Income Taxes	392.00	297.00	225.00	376.00	515.00
Deferred Domestic Income Taxes	(318.00)	(627.00)	(34.00)	587.00	(129.00)
Deferred Foreign Income Taxes	(488.00)	(613.00)	36.00	0.00	170.00
Income Tax Credits	0.00	0.00	0.00	0.00	0.00
Minority Interest	(9.00)	71.00	98.00	49.00	61.00
Equity in Earnings	(39.00)	10.00	36.00	(43.00)	318.00
After Tax Income/Expense	0.00	0.00	0.00	0.00	0.00
Discontinued Operations	0.00	0.00	0.00	0.00	0.00
Net Income Before Extra Items/Preferred Div	**1,780.00**	**1,002.00**	**1,841.00**	**4,328.00**	**2,314.00**
Extra Items & Gain(Loss) Sale of Assets	0.00	(29.00)	(2,944.00)	11.00	N/A
Net Income Before Preferred Dividends	1,780.00	973.00	(1,103.00)	4,339.00	2,314.00
Preferred Dividend Requirements	10.00	10.00	10.00	10.00	10.00
Net Income Available to Common	**1,770.00**	**992.00**	**1,831.00**	**4,318.00**	**2,304.00**

in millions of USD

Table 3. Annual Income Statement

DOMINION RESOURCES (D)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Net Sales or Revenues	13,972.00	12,078.00	10,218.00	10,558.00	9,260.00
Cost of Goods Sold	6,555.00	4,799.00	3,335.00	4,013.00	3,507.00
Depreciation, Depletion & Amortization	1,433.00	1,334.00	1,379.00	1,322.00	1,268.00
Gross Income	**5,984.00**	**5,945.00**	**5,504.00**	**5,223.00**	**4,485.00**
Selling, General & Admin Expenses	N/A	N/A	2,174.00	N/A	N/A
Other Operating Expenses	3,267.00	2,736.00	429.00	2,641.00	2,496.00
Other Expenses - Total	11,255.00	8,869.00	7,317.00	7,976.00	7,271.00
Operating Income	2,717.00	3,209.00	2,901.00	2,582.00	1,989.00
Extraordinary Credit - Pretax	N/A	0.00	8.00	0.00	0.00
Extraordinary Charge - Pretax	N/A	794.00	24.00	757.00	460.00
Non-Operating Interest Income	N/A	N/A	N/A	N/A	N/A
Reserves - Inc(Dec)	0.00	0.00	0.00	0.00	0.00
Pretax Equity in Earnings	N/A	0.00	0.00	N/A	N/A
Other Income/Expenses - Net	152.00	81.00	92.00	184.00	95.00
Earnings Before Interest and Taxes (EBIT)	**2,869.00**	**2,496.00**	**2,977.00**	**2,009.00**	**1,624.00**
Interest Expense On Debt	1,009.00	1,071.00	1,040.00	1,038.00	980.00
Interest Capitalized	70.00	96.00	95.00	41.00	22.00
Pretax Income	1,930.00	1,521.00	2,032.00	1,012.00	666.00
Income Taxes	700.00	597.00	681.00	370.00	183.00
Current Domestic Income Taxes	144.00	143.00	(33.00)	166.00	275.00
Current Foreign Income Taxes	(3.00)	1.00	0.00	3.00	0.00
Deferred Domestic Income Taxes	564.00	465.00	719.00	175.00	(95.00)
Deferred Foreign Income Taxes	12.00	6.00	13.00	45.00	22.00
Income Tax Credits	17.00	18.00	18.00	19.00	19.00
Minority Interest	0.00	0.00	0.00	0.00	2.00
Equity in Earnings	34.00	25.00	11.00	0.00	N/A
After Tax Income/Expense	0.00	0.00	0.00	0.00	0.00
Discontinued Operations	0.00	(642.00)	0.00	0.00	0.00
Net Income Before Extra Items/Preferred Div	**1,264.00**	**307.00**	**1,362.00**	**642.00**	**481.00**
Extra Items & Gain(Loss) Sale of Assets	(15.00)	11.00	0.00	0.00	21.00
Net Income Before Preferred Dividends	1,249.00	318.00	1,362.00	642.00	502.00
Preferred Dividend Requirements	0.00	0.00	0.00	98.00	66.00
Net Income Available to Common	**1,264.00**	**307.00**	**1,362.00**	**544.00**	**415.00**

in millions of USD

Table 4. IBM
Return on Assets, Sales, and Equity, Selected Years, 1950-2004

Year	ROA	ROS	ROE
1963	12.2%	14.1%	18.2%
1970	11.9	13.6	17.1
1980	13.4	13.6	21.7
1985	12.5	13.1	20.5
1990	6.9	8.7	14.1
1995	5.0	5.8	18.8
2000	9.2	9.2	39.7
2001	8.7	8.9	32.7
2002	5.5	6.6	23.4
2004	7.7	8.9	28.4

Where ROA=Return on Total Assets;
ROS=Return on Sales;
ROE=Return on Stockholder Equity.

Table 5. DuPont
Return on Assets, Sales, and Equity, Selected Years, 1950-2004

Year	ROA	ROS	ROE
1963	17.4%	18.3%	21.4%
1970	9.2	9.1	13.0
1980	7.4	5.2	13.1
1985	4.5	3.8	9.0
1990	6.9	8.7	14.1
1995	8.8	9.0	40.2
2000	5.9	8.1	17.7
2001	10.7	17.2	30.5
2002	5.3	7.6	20.9
2003	5.0	6.5	16.0

Where ROA=Return on Total Assets;
ROS=Return on Sales;
ROE=Return on Stockholder Equity.

Table 6. Dominion Resources
Return on Assets, Sales, and Equity, Selected Years, 1950-2004

Year	ROA	ROS	ROE
1963	4.8%	203%	15.0%
1970	3.9	19.2	12.6
1980	3.7	11.4	13.0
1985	4.4	13.6	13.8
1990	4.6	14.3	13.9
1995	3.4	10.1	9.9
2000	1.4	4.5	5.8
2001	1.6	5.2	6.5
2002	3.6	13.3	13.3
2004	2.8	9.2	11.2

Where ROA=Return on Total Assets;
ROS=Return on Sales;
ROE=Return on Stockholder Equity.

Table 7. Annual Cash Flow Statement
INT'L BUSINESS MACHS (IBM)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Net Income / Starting Line	8,448.00	7,613.00	5,334.00	7,723.00	8,093.00
Depreciation, Depletion & Amortization	4,915.00	4,916.00	4,379.00	4,820.00	4,995.00
Depreciation & Depletion	3,959.00	3,961.00	3,691.00	4,195.00	4,513.00
Amoritization of Intangible Assets	956.00	955.00	688.00	625.00	482.00
Deferred Income Taxes & Investment Tax Credit	2,081.00	1,126.00	(67.00)	658.00	29.00
Deferred Income Taxes	2,081.00	1,126.00	(67.00)	658.00	29.00
Investment Tax Credit	0.00	0.00	0.00	0.00	0.00
Other Cash Flow	(483.00)	(225.00)	343.00	88.00	(792.00)
Funds From Operations	14,961.00	13,430.00	9,989.00	13,289.00	12,325.00
Extraordinary Items	0.00	0.00	0.00	0.00	0.00
Funds From/For Other Operating Activities	362.00	1,139.00	3,077.00	976.00	(3,051.00)
Dec(Inc) In Receivables	2,613.00	2,024.00	4,125.00	3,284.00	(4,720.00)
Dec(Inc) In Inventories	(291.00)	293.00	793.00	337.00	(55.00)
Inc(Dec) In Accounts Payable	411.00	617.00	(55.00)	(969.00)	2,245.00
Inc(Dec) In Income Taxes Payable	0.00	0.00	0.00	0.00	0.00
Inc(Dec) In Other Accruals	0.00	0.00	0.00	0.00	0.00
Dec(Inc) In Other Assets/Liabilities	(2,371.00)	(1,795.00)	(1,786.00)	(1,676.00)	(521.00)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Net Cash Flow - Operating Activities	**15,323.00**	**14,569.00**	**13,066.00**	**14,265.00**	**9,274.00**
Capital Expenditures (Additions To Fixed Assets)	4,368.00	4,393.00	4,753.00	5,660.00	5,616.00
Additions To Other Assets	688.00	581.00	597.00	655.00	565.00
Net Assets From Acquisitions	1,738.00	1,836.00	3,158.00	916.00	0.00
Increase In Investments	8,718.00	6,471.00	1,582.00	778.00	1,079.00
Decrease In Investments	8,830.00	7,023.00	1,185.00	738.00	1,393.00
Disposal Of Fixed Assets	1,336.00	1,136.00	2,008.00	1,165.00	1,619.00
Other Uses - Investing	0.00	162.00	0.00	0.00	0.00
Other Sources - Investing	0.00	0.00	0.00	0.00	0.00
Net Cash Flow - Investing	**5,346.00**	**5,284.00**	**6,897.00**	**6,106.00**	**4,248.00**
Proceeds From Stock Options	0.00	0.00	0.00	0.00	0.00
Other Proceeds From Sale/Issue of Stock	0.00	0.00	0.00	0.00	0.00
Com/Pfd Purchased, Retired, Converted, Redeemed	5,418.00	3,232.00	3,087.00	3,906.00	6,073.00
Long Term Borrowings	2,438.00	1,573.00	6,726.00	4,535.00	9,604.00
Inc(Dec) In Short Term Borrowings	1,073.00	777.00	(4,087.00)	2,926.00	(1,400.00)
Reduction In Long Term Debt	4,538.00	5,831.00	5,812.00	7,898.00	7,561.00
Cash Dividends Paid - Total	1,174.00	1,085.00	1,005.00	966.00	929.00
Common Dividends (Cash)	1,174.00	1,085.00	1,005.00	956.00	909.00
Preferred Dividends (Cash)	0.00	0.00	0.00	10.00	20.00
Other Sources - Financing	0.00	0.00	0.00	0.00	0.00
Other Uses - Financing	0.00	0.00	0.00	0.00	0.00
Net Cash Flow - Financing	**(7,619.00)**	**(7,798.00)**	**(7,265.00)**	**(5,309.00)**	**(6,359.00)**
Effect of Exchange Rate On Cash	405.00	421.00	148.00	(83.00)	(147.00)
Changes In Cash And/Or Liquid Items	0.00	0.00	0.00	0.00	0.00

in millions of USD

Table 8. Annual Cash Flow Statement
DU PONT DE NEMOURS (DD)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Net Income / Starting Line	1,780.00	1,002.00	1,841.00	4,339.00	2,314.00
Depreciation, Depletion & Amortization	1,347.00	1,584.00	1,515.00	1,754.00	1,860.00
Depreciation & Depletion	1,124.00	1,355.00	1,297.00	1,320.00	1,415.00
Amoritization of Intangible Assets	223.00	229.00	218.00	434.00	445.00
Deferred Income Taxes & Investment Tax Credit	0.00	0.00	0.00	0.00	0.00
Deferred Income Taxes	0.00	0.00	0.00	0.00	0.00
Investment Tax Credit	0.00	0.00	0.00	0.00	0.00
Other Cash Flow	1,441.00	2,249.00	422.00	(5,182.00)	888.00
Funds From Operations	4,568.00	4,835.00	3,778.00	911.00	5,062.00
Extraordinary Items	0.00	0.00	0.00	0.00	0.00
Funds From/For Other Operating Activities	(1,337.00)	(2,246.00)	(1,725.00)	1,508.00	8.00
Dec(Inc) In Receivables	(309.00)	(852.00)	468.00	435.00	379.00
Dec(Inc) In Inventories	(140.00)	(125.00)	(476.00)	(362.00)	(727.00)
Inc(Dec) In Accounts Payable	(28.00)	(51.00)	(106.00)	(634.00)	87.00
Inc(Dec) In Income Taxes Payable	0.00	0.00	0.00	0.00	269.00
Inc(Dec) In Other Accruals	(860.00)	(1,218.00)	(1,611.00)	2,069.00	0.00
Dec(Inc) In Other Assets/Liabilities	0.00	0.00	0.00	0.00	0.00
Net Cash Flow - Operating Activities	**3,231.00**	**2,589.00**	**2,053.00**	**2,419.00**	**5,070.00**
Capital Expenditures (Additions To Fixed Assets)	1,232.00	1,713.00	1,280.00	1,494.00	1,925.00
Additions To Other Assets	0.00	0.00	0.00	0.00	0.00
Net Assets From Acquisitions	119.00	1,527.00	819.00	78.00	46.00
Increase In Investments	203.00	71.00	454.00	142.00	97.00
Decrease In Investments	0.00	458.00	0.00	0.00	25.00
Disposal Of Fixed Assets	3,840.00	17.00	196.00	8,051.00	703.00
Other Uses - Investing	509.00	1,076.00	0.00	227.00	0.00
Other Sources - Investing	159.00	537.00	28.00	0.00	96.00
Net Cash Flow - Investing	**(1,936.00)**	**3,375.00**	**2,329.00**	**(6,110.00)**	**1,244.00**
Proceeds From Stock Options	197.00	52.00	34.00	153.00	63.00
Other Proceeds From Sale/Issue of Stock	0.00	0.00	0.00	0.00	0.00

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Com/Pfd Purchased, Retired, Converted, Redeemed	457.00	0.00	470.00	1,818.00	462.00
Long Term Borrowings	1,601.00	553.00	934.00	904.00	4,996.00
Inc(Dec) In Short Term Borrowings	(3,853.00)	3,824.00	607.00	(1,588.00)	(95.00)
Reduction In Long Term Debt	1,555.00	954.00	1,699.00	2,214.00	6,574.00
Cash Dividends Paid - Total	1,404.00	1,407.00	1,401.00	1,460.00	1,465.00
Common Dividends (Cash)	1,394.00	1,397.00	1,391.00	1,450.00	1,455.00
Preferred Dividends (Cash)	10.00	10.00	10.00	10.00	10.00
Other Sources - Financing	0.00	0.00	0.00	1,980.00	0.00
Other Uses - Financing	79.00	2,037.00	0.00	0.00	0.00
Net Cash Flow - Financing	**(5,550.00)**	**31.00**	**(1,995.00)**	**(4,043.00)**	**(3,537.00)**
Effect of Exchange Rate On Cash	404.00	425.00	186.00	(263.00)	(215.00)
Changes In Cash And/Or Liquid Items	0.00	0.00	0.00	0.00	0.00

in millions of USD

Table 9. Annual Cash Flow Statement
DOMINION RESOURCES (D)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Net Income / Starting Line	1,264.00	307.00	1,362.00	642.00	415.00
Depreciation, Depletion & Amortization	1,433.00	1,334.00	1,379.00	1,322.00	1,268.00
Depreciation & Depletion	1,371.00	1,280.00	1,326.00	1,322.00	1,268.00
Amoritization of Intangible Assets	62.00	54.00	53.00	0.00	0.00
Deferred Income Taxes & Investment Tax Credit	554.00	452.00	714.00	201.00	22.00
Deferred Income Taxes	554.00	452.00	714.00	201.00	22.00
Investment Tax Credit	0.00	0.00	0.00	0.00	0.00
Other Cash Flow	(65.00)	714.00	8.00	43.00	(12.00)
Funds From Operations	3,186.00	2,807.00	3,463.00	2,208.00	1,693.00
Extraordinary Items	0.00	0.00	0.00	0.00	0.00
Funds From/For Other Operating Activities	(347.00)	(452.00)	(1,015.00)	195.00	(350.00)
Dec(Inc) In Receivables	(288.00)	(531.00)	(814.00)	414.00	(842.00)
Dec(Inc) In Inventories	(24.00)	(234.00)	(55.00)	(170.00)	(62.00)
Inc(Dec) In Accounts Payable	55.00	396.00	527.00	(25.00)	674.00
Inc(Dec) In Income Taxes Payable	0.00	0.00	0.00	0.00	0.00
Inc(Dec) In Other Accruals	(9.00)	42.00	58.00	(111.00)	139.00
Dec(Inc) In Other	(81.00)	(125.00)	(731.00)	87.00	(259.00)

(Continued)

Table 9. (Continued)

	Dec-04	Dec-03	Dec-02	Dec-01	Dec-00
Assets/Liabilities					
Net Cash Flow - Operating Activities	**2,839.00**	**2,355.00**	**2,448.00**	**2,403.00**	**1,343.00**
Capital Expenditures (Additions To Fixed Assets)	2,750.00	3,438.00	2,828.00	2,168.00	1,738.00
Additions To Other Assets	0.00	0.00	0.00	0.00	0.00
Net Assets From Acquisitions	0.00	0.00	410.00	2,215.00	2,779.00
Increase In Investments	490.00	777.00	0.00	104.00	375.00
Decrease In Investments	466.00	912.00	54.00	30.00	137.00
Disposal Of Fixed Assets	729.00	305.00	0.00	141.00	836.00
Other Uses - Investing	132.00	1,018.00	795.00	160.00	2,933.00
Other Sources - Investing	921.00	643.00	19.00	283.00	4,255.00
Net Cash Flow - Investing	**1,256.00**	**3,373.00**	**3,960.00**	**4,193.00**	**2,597.00**
Proceeds From Stock Options	223.00	112.00	0.00	0.00	0.00
Other Proceeds From Sale/Issue of Stock	616.00	878.00	2,420.00	992.00	532.00
Com/Pfd Purchased, Retired, Converted, Redeemed	0.00	0.00	201.00	0.00	1,641.00
Long Term Borrowings	877.00	3,393.00	2,434.00	7,365.00	8,108.00
Inc(Dec) In Short Term Borrowings	(879.00)	259.00	(666.00)	(1,620.00)	1,820.00
Reduction In Long Term Debt	1,283.00	2,922.00	1.90	4,193.00	6,813.00
Cash Dividends Paid - Total	861.00	825.00	723.00	649.00	615.00
Common Dividends (Cash)	861.00	825.00	723.00	649.00	615.00
Preferred Dividends (Cash)	0.00	0.00	0.00	0.00	0.00
Other Sources - Financing	0.00	0.00	0.00	21.00	0.00
Other Uses - Financing	13.00	42.00	1,945.10	0.00	57.00
Net Cash Flow - Financing	**(1,320.00)**	**853.00**	**1,317.00**	**1,916.00**	**1,334.00**
Effect of Exchange Rate On Cash	0.00	0.00	0.00	0.00	0.00
Changes In Cash And/Or Liquid Items	0.00	0.00	0.00	0.00	0.00

in millions of USD

Table 10. Firm Sources and Uses of Funds, 1998-2004

Total Sources and Uses of Funds ($ B)	IBM	DuPont	Dominion Resources
Net Income	$51,251 Million	$13,132	$5.687
Depreciation	31,323	10,956	7.650
Capital Expenditures	37,269	11,939	13.930
Dividends	6,802	10.127	1.858
New Equity Issues	0	924	4,980.5
New (long term) Debt Issues	38,576	23,743	30,879.4
Long term Debt Repurchased	34.644	27,574	25,623
Equity Repurchased	45,092	4601	2,177

Table 11. Net Capital Issues and Dividends, 1971-2004 ($ B)

Net Capital Issues	IBM	DuPont	Dominion Resources
Net Equity	-54,128	-9.079	7.038
Net Debt	7.310	3.759	10.460

Notes

[1]Operating statements for internal control can be made up for any feasible time period. Most large firms present quarterly statements for their investors, although the annual results carry the most weight and go into the record books of the financial services, such as *Mergent*'s (formerly *Moody*'s), *Standard & Poor's*, et. al.

[2]To refer to depreciation charges as a source of funds is the common shorthand usage, which to be frank is somewhat inaccurate. Strictly speaking, only the firm's operations provide funds. If the firm's revenues did not exceed its direct expenses, there would be no funds flow for the period. However, since the depreciation charge is added to retained earnings for the period to obtain the total of reinvested internally generated funds, the custom has grown of referring to depreciation as a source of funds.

[3]The relationship between common and preferred stock is explained more fully in Chapter 8.

[4]See the discussion in Chapter 3 on depreciation and inventory valuation.

[5]For a fuller discussion of dividends and their relationship to earnings and the value of common stock see Chapter 8.

[6]The return on assets may be expressed as the ratio of net income to total assets, or the ratio of net income to average total assets. Accountants often prefer to express the ROA as earnings before interest and taxes (EBIT) divided by average total assets.[White, Sondhi, and Fried (1998)], p. 147. Alternatively, White, Sondhi, and Fried present the ratio of net income plus after-tax interest cost, relative to average total assets (p.147). These accountants use average sales and stockholder equity in the ROS and ROE calculations. We use the year-end total assets, sales, and stockholder equity in this text.

[7]That is, if the recipient of the income is an individual and not a nontaxable institution or another corporation. An 85 per cent dividend received credit is given to corporations for dividends received from another corporation which is non-consolidated. (To consolidate for tax purposes, the parent must own a minimum of 80 per cent of the subsidiary's shares.) The other 15 per cent is taxed at the usual corporate income tax rate.

[8]Drtina and Largay (1985) examined cash flow reporting with regard to "cash flow from operations" (CFO). Problems can develop because of ambiguity in terms of the definition of "operations," the measurement of the current position of long-term leases (noted in Chapter 9), diversity in reporting practices, and reclassification of current and noncurrent accounts. Krishnan and Largay (2000) reported that past direct method cash flows offer better

predictions of future operating cash flows than indirect method cash flows information. The direct method of presenting cash flows OCF for time t is predicted to be:

$$OCF_t = \int(CSHRD_{t-1}, CSHPD_{t-1}, INTRD_{t-1}, INTPD_{t-1}, TXPD_{t-1})$$

where

$CSHRD_{t-1}$ = Cash Received from Customers at time t-1,
$CSHPD_{t-1}$ = Cash Paid to Suppliers and Employees at time t-1,
$INTRD_{t-1}$ = Interest Received at time t-1,
$INTPD_{t-1}$ = Interest Paid at time t-1,

and

$TXPD_{t-1}$ = Taxes Paid at time t-1.

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Problem

Look up the income statement Lucent Technologies, Inc. in Mergent's *Industrial Manual* or Standard and Poor's *Stock Guide*, and secure the company's latest annual report. Obtain or calculate the following accounts for the last five years:

a. Total revenue
b. Total operating expenses
c. Depreciation
d. EBIT
e. Earnings before taxes
f. Earnings after taxes
g. Earnings per share of common stock
h. Net cash flow per share
i. Retained earnings per common share
j. Return on assets
k. Return on sales
l. Return on equity

Chapter 5

FINANCING CURRENT OPERATIONS, RATIO AND CREDIT ANALYSIS

Current financing encompasses managing and utilizing current assets, and incurring and repaying current debt. The current assets of a firm differ from fixed assets; these differences are not abrupt but represent a continuum. The current assets (cash, receivables, inventory, etc.) support the short-run operations of the business. Current assets are what the classical economists called "circulating capital." Within the current asset grouping, however, some items remain in the firm's possession longer than others.

1. WORKING CAPITAL CONCEPTS

The reader was introduced the firm's annual cash flow statement in the previous chapter. This chapter integrates current asset management, sources and uses of funds, and ratio analysis. In financial terminology the total current assets, primarily cash, and other items likely to be turned into cash within the year, is called the gross working capital of the firm. The current assets of the firm, less the current liabilities, are the net working capital of the firm. When the term working capital is used, net is usually intended.

The net working capital of the firm is an important aspect of its financial strength. It represents the current assets, not offset by current creditor claims, that can be used to meet unexpected expenditures, absorb irregularities in the firm's cash flow, and cushion any short-run interruption, seasonality, or lumpiness in the flow of funds through the firm.[1] In addition, adequate working capital allows the firm to make especially opportune purchases and to take advantage of immediate expansion possibilities. Net working capital is not to be confused with cash, but it functions similarly as a sort of generalized short-term working balance for the firm.

How much net working capital a firm should carry depends on many factors. Generally, the net working capital a firm carries depends on its sales volume, its needs for gross circulating capital relative to its sales volume, and the stability of its operations. A firm can increase its rate of profit by economizing on the use of net working capital, but this has the effect of increasing its short-term financial risk. A firm can minimize its net working capital requirements, however, if any of the following conditions exist: (1) its flow of cash receipts tends to be stable and predictable; (2) its current assets tend to be marketable, stable in value, or short-term and liquid; (3) the amount of long-term debt is small for the type of firm.

On the other hand, net working capital needs are higher for firms with the following characteristics: (1) those with erratic or irregular cash flows or cash demands; (2) those carrying slow-moving inventories which do not have active trading markets or whose market prices tend to fluctuate; (3) those firms that by the nature of their business extend considerable credit to dubious risks.

2. QUANTITATIVE WORKING CAPITAL MODELS – CASH MANAGEMENT

There are several well-known quantitative working capital models. The first model, developed by Baumol in 1952, optimized the firm's cash balance by minimizing total costs per year of maintaining cash balances. Total costs, TC, were composed of transactions costs and an opportunity cost of maintaining additional cash balances.

$$TC = t\left(\frac{Cu}{C}\right) + i\left(\frac{C}{2}\right) \tag{1}$$

where Cu = cash usage for the year,
t = transactions costs per sale or purchase of marketable securities,
i = annual interest rate on marketable securities,
and C = Cash balance.

One minimizes the costs of selling and buying securities and holding cash on which one could earn interest. Thus, to minimize ones total costs, one takes the derivative of TC with respect to its cash balance, and sets the derivative to zero.[2] The optimal cash level, C*, is:

$$C^* = \sqrt{\frac{2tCu}{i}} \tag{2}$$

The optimal cash balance is positively associated with total cash usage and negatively associated with the interest rate, in the Baumol formulation. If a firm uses \$100 million of cash in a given year, the interest rate is 5 percent, and its transactions cost is \$50, then its optimal cash balance is:

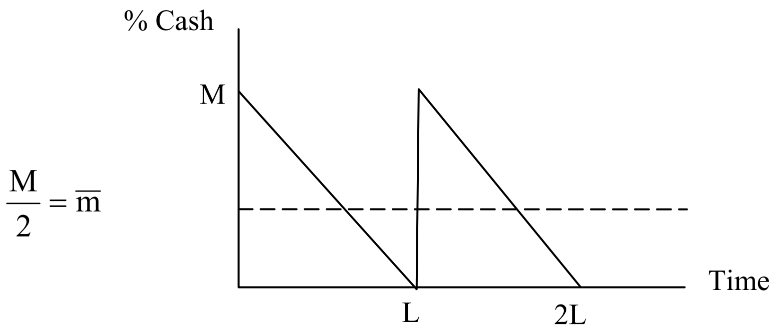
$$C^* = \sqrt{\frac{2(\$50)\$100{,}000{,}000}{.05}}$$

$$C^* = \sqrt{\frac{10{,}000{,}000{,}000}{.05}}$$

$$C^* = \$447{,}213.60$$

The optimal cash balance for the firm should be \$447,213.60.

A second cash management model is the Miller-Orr (1966) control limit model that built upon the Baumol formulation. The firm earns interest on its savings deposits and has a noninterest bearing cash balance. The firm transfers M dollars from its savings deposit into its cash account. The average cash balance is $\frac{M}{2}$, or m. Cash usage to a minimum acceptable level, zero, occurs every L days. Cash transfers occur every M/m days. In the Miller-Orr framework,



Miller and Orr defined ν as the annual interest rate and γ as the transaction cost. The Baumol formulation could be written as:

$$M^* = \left(\frac{2\gamma m}{\nu}\right)^{.5} \tag{3}$$

The optimal period of M* transfers is

$$L^* = \left(\frac{2\gamma}{m^*}\right)^{.5} \tag{4}$$

If p is the probability that the cash balance will increase by m dollars then 1-p, or q, is the probability of a cash decrease. The Expected costs of maintaining the cash balance over a T day planning horizon is:

$$E(dc) = \gamma \frac{E(N)}{T} + \nu\, E(M) \tag{5}$$

where E(dc) = expected daily costs
E(N) = expected number of cash transfers,
E(M) = expected (average) daily cash balance.

Miller and Orr further assumed that a firm maintained an upper bound on its cash balance of h, a balance level of z, and its transfer of lump-sum cash would be (h-z) dollars. Miller and Orr converted the expected value of the cash duration, Z(h-z), into time (days by dividing by t, the number of operating days. The expected during in days is:

$$= \frac{Z^1(h^1 - Z^1)}{m^2 t} \tag{6}$$

where Z^1 = Z-m
and h^1 = h-m.

The mean cash balance is $\dfrac{h+Z}{3}$.

The cash transfer, Z, is h-Z.[3]
Miller and Orr found that the optimal cash transfer was a positive function of cash transfer cost, daily cash balances, and an inverse function of the daily interest rate.

$$z^* = \left(\frac{3\gamma m^2 t}{4\upsilon}\right)^{.333} \tag{10}$$

$$Z^* = 2z^*$$

and $h^* = 3z^*$.

The Miller-Orr model allows the corporate Treasurer to invest excess cash when cash balances reach the upper control limit, h, returning the cash balance to its mean cash balance.

3. SOURCES OF NET WORKING CAPITAL

Since net working capital is the current assets minus the current debt, net working capital (by definition) must be supplied by equity and/or long-term debt. Thus, net working capital is financed from permanent or semi-permanent sources.

Working capital is not a static item, however, but expands and contracts with the level of the firm's operations. (Gross working capital is likely to show much wider proportionate changes.) Only on occasion does an established firm go out to the capital markets for additional working capital; normally, working capital is increased or depleted by internal operations of the business.

The main financial items affecting the level of working capital fall within two categories. Those that increase net working capital funds are: (1) net operating profits; (2) current depreciation charges insofar as they are covered by revenues over variable costs; (3) sales of fixed or other assets for current funds; (4) issuing new bonds or stocks if the funds obtained are not all used to acquire fixed assets. Financial events that decrease net working capital funds are: (1) operating losses; (2) payment of dividends; (3) purchase of fixed or other noncurrent assets; (4) repayment of long-term debt; (5) buybacks, i.e. repurchasing the corporation's own shares with available funds.

4. RATIO ANALYSIS AND WORKING CAPITAL

Ratio analysis is an alternative to the flow of funds method of working capital analysis, although the two can be used to supplement each other. Ratio analysis is older and possibly the more popular approach than the flow of funds method of management, and is the most readily available to credit managers of other companies, or other outsiders. A person within the firm sometimes finds other analytical tools more useful.

Ratio analysis consists of studying ratio or percentage relationships of meaningful financial data. The results are compared (1) with standard ratios – i.e., the averages of similar firms, (2) with the firm's ratios in previous years, or (3) with some implicit standards existing in the mind of the analyst. In the hands of a skilled practitioner both “external analysis” (comparisons to standard ratios) and internal analysis (i.e., trends and relationships of the ratios within the company) can be revealing.

Innumerable ratios can be developed, since the financial accounts can be placed in almost unlimited combinations. For most purposes, however, about thirteen popular ratios suffice for whatever can be learned from this method about the firm’s current financial position.[4] In many cases only six to ten of these ratios are needed for an understanding of the problem. If special areas seem to warrant additional attention, it is not difficult to develop other ratios.

The following thirteen ratios are the most generally used. The first five are most relevant for current analysis. The remaining eight reveal more general relationships.

Current Analysis Ratios

1. Current Ratio, CR
2. Acid Test, AT
3. Sales/Receivables, SR
4. Sales/Inventory, SI
5. Sales/Net Working Capital, SNWK

General Analysis Ratios

6. The financial structure Ratios – Total Debt/Assets, TDA
7. Sales/Total Assets, SA
8. Net Profit/Total Assets, ROA
9. Net Profit/Tangible Net Worth, ROTNW
10. Net Profit/Equity, ROE
11. EBIT /Interest, TIE

Composite Firm Relative Valuation Ratios

12. DuPont Analysis, DuPontA
13. Altman – Z Model, NewZ

4.1 Current Analysis Ratios

Current Ratio. The current ratio is obtained by dividing the current liabilities into the current assets. It indicates how many times current liabilities are covered by gross working capital. The higher the current ratio, the more conservative the current financial position of the firm. A two-to-one ratio is a rule-of-thumb benchmark indicating a minimum level of the working capital position. Other circumstances must always be considered; no financial analysis can proceed rigidly. A ratio below two does not necessarily make the firm unsafe, nor does a current ratio well over two insure financial soundness. Much depends upon the collectibility and time structures of the firm's receivables and the type and quantity of inventory the firm carries. Public utilities often have a current ratio of one to one or below.[5] In an electric utility company, for example, the low current ratio is possible because of its minimum inventory requirements and the stability of its revenues and cash flow.

Acid Test. The acid test, or quick ratio, is obtained by dividing current liabilities into the firm's net receivables and cash. This ratio highlights the firm's short-term liquidity position. The rule-of-thumb measure of a satisfactory acid test ratio is one to one. From an obverse point of view, the acid test ratio tends to indicate the amount of inventory in the working capital position of the firm. For example, if the current ratio is 3 to 1 and the acid test is only .85 to 1, the inventory account probably constitutes a heavy proportion of the current assets.

Sales to Receivables or the Receivable Turnover Ratio. This ratio is obtained by dividing credit sales by the outstanding trade accounts and trade notes receivable, and indicates the collectibility and current condition of the receivables. The higher the sales to receivables ratio, the more current are the receivables. A variant of this ratio is to divide the turnover rate into 360 (representing the approximate number of days in the year). The resulting figure gives the number of days it takes to collect an average account. This figure can be compared to the usual terms (or allowable credit time) granted by the firm to ascertain whether the average account is collected in a period close to the credit terms.

Sales to Inventory: Approximate Inventory Turnover. This ratio is obtained by dividing the inventory into the sales figure. The result is useful in analyzing how rapidly the firm's inventory is sold. A slow turnover – relative to the type of business or its own previous performance – may indicate that the firm is overstocked, or that the inventory contains too many old or out-of-style items, or that the management is speculating in inventory. Again, as in the case of the receivable turnover, the inventory turnover figure can be divided into 360 days to get an average of how many days it takes for a given dollar amount of merchandise to be turned into an equivalent amount of sales.

Many analysts prefer to reserve the term "inventory turnover" for the ratio of inventory divided into the cost' of goods sold. The ratio then indicates the true physical turnover of the inventory. Since the sales figure contains the gross markup (profit) over cost, the sales over inventory ratio overstates the actual physical turnover of the goods. The higher the customary gross margin, or markup over cost in the sales figure, the better the inventory into sales ratio appears in comparison to the true turnover ratio.[6] Unfortunately, the figure for the cost of goods sold is not always as available as the amount of sales. Thus, the standard ratios are more often based on sales. Ratio analysis, in any case, is not an exact science but is, based on historical or intra-industry comparisons. The ratio serves its purpose as long as it depicts a logical relationship and comparisons using it are made on a consistent basis.

Sales Divided by the Receivables + Inventory: The Cash Cycle. This ratio is obtained by dividing sales by the basic noncash, working assets. The ratio is usually used in its cash cycle form; the result of dividing the inventory and receivables into the annual sales are further divided into 360 days. The result is the average approximate number of days from the time material comes into the possession of the firm until it is turned into cash. If the time required by the cash cycle is shorter in comparison to that of similar firms or to the firm's own past, the firm is relatively efficient in utilizing its current working assets. The contrary is also true. Comparing the cash cycle to the customary credit terms the firm receives from its suppliers helps determine the firm's need for net working capital. If the terms are longer than the cash cycle, the relative amount of net working capital can be minimized. If the cash cycle is equal to or longer than the customary time allowed for payment by trade creditors, the firm requires a greater amount of net working capital to stay safely in business.

Sales/Net Working Capital: Working Capital Turnover. The net working capital turnover is obtained by dividing net working capital into the annual sales. This ratio is double-edged; a high ratio can indicate either efficiency or risk. A low turnover may indicate managerial inefficiency in moving goods and collecting receivables, or it may indicate excessively conservative management – a tendency to hold redundant idle funds or a failure to use a reasonable amount of available current credit. The other edge of the ratio appears if the turnover is too high in contrast with the industry norm. It may not necessarily indicate efficiency but a tendency to take on undesirable levels of risk. An especially high net working capital turnover can indicate overtrading on current account – an attempt to carry a heavy volume of business on an inadequate current capital base. Such speculative striving on the part of the management can be dangerous to both owners and creditors.

It should be obvious that the ratios are not to be used singly but in a composite manner to fill out a financial portrait of the company. Thus, the position of the net working capital turnover can be checked against the other current operating ratios. For example, a firm with a high net working capital turnover and ordinary inventory and receivable turnovers whose current ratio is tight is likely to be overtrading. A firm with a low net working capital turnover, a normal cash cycle, and a very high acid test ratio may be holding excessive idle funds. These are only two possibilities. An experienced analyst may be able to rough out normal relationships in his head while scanning the financial figures. His instinct may lead him quickly to any items that are out of line and suggest the few ratios necessary to highlight the potential trouble spot.

4.2 General Analysis Ratios

The current analysis ratios are most important to credit managers who pass on credit sales and others who are interested in the firm's short-term position. The general analysis ratios are useful to investors, long-term creditors, and others concerned with the firm from a longer-term basis. Of course, in any case, whether the analyst's interest is short or long term, selections of pertinent ratios should be made from both groups.

Short-term creditors have sometimes loaned (given) a firm funds on the basis of a good current position, unwisely ignoring other fundamental financial analysis. For although the first grant of credit might be repaid on time, many short-term arrangements turn out to be semi-permanent as the supplier periodically renews or extends new credit to the customer firm. If fundamental financial weaknesses outside the current position are passed, they may cause failure at some later date with consequent losses to the "short-term" creditor.

The Financial Structure Ratios. These ratios, that is the percentage that each major class of financing bears of the total financing of the firm's assets, have been discussed in Chapter 3. Related to the characteristics of the company's operations, these ratios indicate the overall financial risk the firm carries. They can be useful to the short term creditor, the bondholder, or the potential investor in common stock.

Some sources give the financial ratios in the form of current liabilities to equity, long-term debt to equity, etc. This alternate form contains the same information as the financial structure, but the financial structure ratios have the advantage of presenting an immediately comprehensible picture of the composition of the credit side of the company's balance sheet.

4.3 Operating Ratios

Sales to Total Assets. The ratio of sales to total assets indicates how intensively the total assets are used in production. A low sales to total assets ratio in comparison with similar firms or with previous periods gives some indication of idle capacity; i.e.; excess assets compared to the level of operations.

Inter-industry comparisons of this ratio are not very useful. A wholesale distributor, for example, with no processing costs, a small margin, and a large turnover of goods shows a relatively high volume of sales to total assets. A better ratio to measure the basic concept of the rate of utilization of capital would be value-added to total asset – i.e., something approaching a capital coefficient. Unfortunately, possibly because of statistical difficulties, value-added ratios are not commonly used in financial analysis.

Net Profit to Total Assets (Preferred Ratio: EBIT to Total Assets). This ratio is intended to relate the return of the firm to its total investment; i.e., the total assets it has available. It has some use, but it is subject to the criticism that the relationship presented is not the most logical one and that it does not present sufficient new information. The net profit figure has already been reduced by taxes and the cost of external funds (i.e., interest); to relate this figure to total assets is an illogical relating of a net concept (net profits) with a gross concept (total assets). Moreover, the ratio does not give much independent information if the net profit on owners' equity is to be calculated too, as it usually is. Obviously the net profit rate of return (or rate of loss) on total assets is always less than that on the owners' equity. The difference depends upon the relative amount of total leverage.[7]

If we are to get any clear concept of how productively the management has utilized the total assets, the preferable ratio is the EBIT to total assets. In addition, a comparison of this ratio to rate-of-profit on net worth indicates how well the firm has adjusted its financial mix. Comparison of these ratios (allowing for the fact that one is an after-tax return) indicates something about the profitability – but not much about the risk-of the firm's use of leverage.

Net Profit on Tangible Net Worth. This ratio is obtained by dividing the net profit by the common stock equity of the corporation.[8] It gives the rate of return made by the owners of the corporation on the book value of their investment. If this ratio is compared to the rate of return on total assets to determine whether financial leverage operated favorably for the firm, earnings after interest but before taxes (EBT) should be the numerator. Then if the earnings return on assets is properly calculated on the EBIT basis, these two ratios would be properly comparable on a financial basis. For some comparisons of profitability, therefore, it may be better to use the ratio of officers' salaries plus profits before taxes over the net worth as the basis of comparison.

Use of Profitability Ratios for Short-Term Credit Analysis. The profitability ratios, that is the last three ratios just discussed, are usually more relevant for the owners and the managers of the firm than for the short-term creditors. The short-term creditors' position is safe, at least for the short run, as long as the working capital and financial ratios show the firm to be currently sound. The profit ratios, nevertheless, are important indicators of the future. If profit ratios are high (and perhaps trending higher) then perhaps some ratios need not be as high in comparison with other firms. Working capital deficiencies can be restored by high earnings and debt can be met out of a high rate of cash flow. On the other hand, a series of losses can soon deplete an excellent starting working capital position. Thus, a current operating loss position which threatens to continue, or an indicated downward trend in earnings, may be taken as a danger signal, even if the existing working capital ratios seem good.

EBIT to Interest Charges (Times Interest Earned). This ratio is obtained by dividing the firm's annual interest charges into its earnings before interest and taxes.[9] The size of the ratio obtained indicates something of the safety of the long-term debt component of the firm's financing. The operational safety of long-term debt affects the short-term creditors and working capital management indirectly. If the coverage is good, the firm may safely operate on a relatively smaller net working capital margin. A poor or erratic coverage may cast doubt on what otherwise appears to be an adequate current position.

We calculate the current analysis ratios and the general analysis ratios for IBM, DuPont, and Dominion Resources for selected years during the 1962-2004 period, using the WRDS database. These ratios are shown in Tables 1–3. We will discuss the implications of these ratios later in the chapter when we compare them to their respective sector and group medians.

5. FINANCIAL RATIOS AND THE PERCEIVED FINANCIAL HEALTH OF FIRMS

Financial analysis often combines the information of several ratios to gain insight into a picture of the firm's health. In this chapter, we examine two composite measures of the firm's health, the "DuPont System" rate of return, dating back to the early twentieth century, and the Altman Z bankruptcy prediction model, created in 1968. The DuPont system, or measure, takes its net operating income divided by sales and multiplies by the ratio of sales-to-investment, producing a return on investment, ROI.

$$\frac{\text{NOI}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}} = \text{ROI} \tag{11}$$

Stockholders should invest in firms with higher ROIs, and management could seek to maximize the DuPont ROI to maximize its stock price. The DuPont analysis uses information inherent in its return on sales and sales turnover ratios.

Pierre DuPont and Donald Brown, a DuPont employee, developed the DuPont return on investment relationship to access the firm's financial performance. General Electric calculated profitability by dividing earnings by sales (or costs). However, this calculation ignored the magnitude of invested capital. In 1903, Pierre DuPont created a new general ledger account for "permanent investment," where capital expenditures were charged at cost. The DuPont Corporation executive committee was presented with monthly sales, income, and return on invested capital on the firm's thirteen products in 1904 [Chandler (1977)]. Donald Brown contributed to the DuPont analysis pointing out that as sales volume rose, the return of invested capital rose, even if prices remained constant. Brown's "turnover" analysis was defined as sales divided by total investment. The multiplication of turnover by the ratio of earnings-to-sales produced the DuPont return on invested capital, still in use by the DuPont Corporation and most American firms. Total investment includes working capital, cash, inventories, and accounts receivable, and permanent investment, bonds, preferred stock, and stocks. The DuPont return on invested capital combined and consolidated financial, capital, and cost accounting. The DuPont return on total investment helped DuPont develop many modern management procedures for creating operating and capital budgeting and making short-run and long-run financial forecasts.

A second composite model is the Altman Z model, which is useful to identify potential bankrupt firms. The Altman Z score used 5 primary ratios in its initial 1968 version.

$$Z = .012\, X_1 + .014\, X_2 + .033\, X_3 + .006\, X_4 + .999\, X_5 \qquad (12)$$

$$\text{Where } X_1 = \frac{\text{Current Assets} - \text{Current Liabilities}}{\text{Total Assets}}$$

$$X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}}$$

$$X_3 = \frac{\text{EBIT}}{\text{Total Assets}}$$

$$X_4 = \frac{\text{Market Value of Equity}}{\text{Book Value of Debt}}$$

$$X_5 = \frac{\text{Sales}}{\text{Total Assets}}$$

The Altman Z score used a liquidity, past profitability, (present) profitability, leverage, and sales turnover ratios to produce a single score. An Altman Z score of less than 2.67 implied that the firm was not healthy. An Altman Z score exceeding 2.67 implied financial health. The Altman Z score successfully predicted impending bankruptcy for 32 of 33 firms (97%) in the year prior to bankruptcy, for his initial sample. The model correctly predicted 31 of 33 (94%) non-bankrupt firms in this sample for the year prior to bankruptcy.

Altman modified his equation in 2000 to become:

$$Z = .717X_1 + .847X_2 + 3.107X_3 + .420X_4 + .998X_5 \qquad (13)$$

where X_4 is now book value of equity relative to its book value of debt. The new critical level is 2.0. We show the modified and its components Altman Z score in Tables 4–6 for IBM, DuPont, and Dominion Resources for the 1968-2004 period. Please note that the Altman Z incorrectly identified IBM as a bankrupt firm in 1993, although its stockholder returns were quite negative for several years. DuPont is identified as a poor security in 1998. We show the Altman Z for Dominion Resources in Table 6, although the score is relevant for manufacturing firms. Finally, in Table 7, we show the Altman Z score for Lucent, clearly identified as a distressed security, but only by the year 2001. The modified (or New) Z scores are shown by IBES sector in Table 8, one notes the very low New Z scores of utilities, sector 11.

The ratios of companies can be compared to all firms, companies in a sector, or broad segments of the economy, or specific industry groups. We use the sectors and industrial groupings by I/B/E/S, the Institutional Brokerage Estimation System. DuPont is included in I/B/E/S sector 9, Basic Industries, and the Chemical Group. DuPont, in 2004, had a current ratio of 1.916, which is higher than the median Basic Industries value of 1.91, and the Chemicals group median of 1.557. DuPont has a higher ratio of current assets to current liabilities than its sector and industry average, and is considered to be a lower risk firm on a liquidity measure. DuPont's higher current asset position is regarded as a strength by lenders and corporate valuation specialists. DuPont, as we noted in chapter 2, has been historically a very conservative firm with regard to debt and in 2004 DuPont's debt –to-total assets ratio of 0.379 was slightly less than the Basic Industries median of 0.444 and higher than the Chemicals group median of 0.482. DuPont's sales efficiency, as measured by its sales-to-total assets ratio of 0.771, is less than the Basic Industries median value of 0.926, and Chemicals group median of 0.875. One would prefer that a company have a higher sales efficiency ratio. DuPont's profitability, as measured by its ROE, 0.160, exceeds the Basic Industries median value of 0.110, and equals the Chemicals group median of 0.159. DuPont's Altman Z, 1.841, derived by higher liquidity, lower leverage, lower sales efficiency, and mixed profitability, is less than the Basis and Chemical group medians of 2.130 and 1.888, respectively. DuPont would not be a preferred stock on its relative ratio analysis.

IBM maintains fewer liquid assets, as measured by its current ratio, than the Technology sector and Computers group. IBM uses greater leverage than the sector and group. IBM's greater leverage and profitability, as shown in Table 9, produced substantially higher ROE and DuPont ratio values than its sector and industry competitor. The IBM Altman Z is 1.934, lower then the Technology median Altman Z of 2.03, and exceeding the IBES Computers group median Altman Z of 1.115. The IBES computers group is very small, having 3 firms. The Value Line computer group has 21 firms and has a median Altman Z score of 2.069. IBM has mixed results in its comparison with sector and industry group ratios. Dominion Resources uses greater debt and maintains less liquidity than the I/B/E/S utilities sector, and electric utility companies, please see Table 9. Dominion Resources, in 2004, generated lower sales on total assets, 0.307, than its sector, 0.452, and industry competitors, 0.471.

Dominion Resources lower profitability and higher leverage lead to lower ROE and DuPont ratios than its sector and industry groups. Dominion Resources' ROE of 0.112 was slightly higher than the utilities sector median of 0.104 and Electric Utility company median of 0.102 respectively.

A negative Altman Z Score does not guarantee the financial insolvency of a firm. In Table 7, the Altman Z Score and its components are presented for Lucent Technologies. LU. The Altman Z Score collapsed to become negative in 2002 and 2003. Lucent remains in business, and has outperformed the market in 2003-2004 despite its largely horrid fundamental values.[10]

6. THE TIME SERIES OF RATIOS IN THE US, 1963–2004

Is there a consistent pattern of movement in financial ratios over the 1963–2004 period? Yes. For all firms listed on the WRDS database, firms have substantially lowered their liquidity over the 40 year period; the median current ratio falling from 2.432 in 1963 to 1.785 in 2004. The median debt-to-assets ratio has risen slightly, from 0.392 in 1983 to 0.408 in 2004. Sales efficiency has fallen from 1.283 in 1963 to 0.635 in 2004. The median on equity has fallen from 11 percent in 1963 to 9.0 percent in 2004. The falling liquidity, sales efficiency, and return on equity has driven the median Altman (new) Z from 2.992 in 1963 to 1.796 in 2004. The reader will not be surprised to see bankruptcies rise during the 1963–2004 period, as we will show in Chapter 19.

7. LIMITATIONS OF RATIO ANALYSIS

Although ratio analysis is an extremely versatile tool, applying it can be dangerous if its limitations are not understood. Ratios differ among industries, as we have shown. Ratio analysis may be useless if the analyst does not have a feeling for the normal differences among different industries. Furthermore, if the firm has misled the financial community, such as WorldCom and Enron, in its financial disclosures, then ratio calculation and analysis using incorrect data cannot be correct. We will examine bankruptcy in Chapter 19 and calculate the WorldCom in 2001.

The user of ratios should be aware of seasonal factors. Usually, according to the results of the ratios, a firm appears in its best financial health at the seasonal low point of its annual operations. Inventory and collectibles are at minimum levels; funds normally invested in these assets have been released and are generally applied to reduce current obligations. These developments tend to improve almost all the working capital ratios. Most firms draw up their annual statements as of December 31. For many industries the end of the normal calendar year is as good a point as any to present the financial statements. In industries whose seasonal low point is not at December 31, some firms set the closing of their books at the end of their "natural" year. The analyst must be aware that the statement date often presents a better financial picture of the firm than that which prevails during the operating year. He must also be careful in making comparisons to allow for differing seasonal patterns among firms and industries and to take into account the use of possible different statement dates.

An attempt to solve the problem of seasonal or other variation in the statements has been made by taking such items as inventory or accounts receivable as an average between two statement figures. As in so many attempts to be extremely accurate, the slight improvement in results does not seem worth the additional effort. The figures may be difficult to obtain, and if the figures used to obtain the average come out of about the same seasonal position, the averages still do not represent the intra-operational relation of the accounts. Moreover, standard ratios used for comparison are not generally based on averages. Only where there has been a drastic change in the level of the firm's activity does the use of averages seem justified, and in such cases, ratios may not be the most fruitful method of analysis.

8. WORKING CAPITAL ANALYSIS AND GRANTING CREDIT

The various tools of working capital analysis are useful to the internal management in forecasting the need for short-term funds and in assuring the safety and short-run liquidity of the firm. Investors may, of course, also be interested in the working capital relationships. Of all the techniques of short-term financial analysis, however, ratios are most commonly applied as a guide to decisions on the granting of credit. The most consistent users of ratio analysis are likely to be found in the credit departments of suppliers and in the loan departments of commercial banks.[11]

When used in granting credit, ratio analysis helps classify the credit customer into different grades of risk. The grantor of credit desires some inkling of the chance of loss-the percentage of the accounts he may be unable to collect-on each class of customer of different financial strength.[12] An experienced and perceptive credit analyst can roughly grade various credit applicants. The credit department might roughly predict that 0.5 per cent of the total credit sales made over the year to firms having certain financial and business characteristics are likely to be uncollected. For another group of customers perhaps the loss rate in uncollected accounts might amount to 15 per cent of the annual sales: Presumably there are all sorts of classes or grades in between.[13]

The credit department has to decide which grades of risks may be extended credit. Credit losses can be minimized by selling only to the financially strongest customers, but this would cause a loss of sales volume. The credit department's objective is to minimize losses, but management wishes also to maximize business volume. The problem can be brought near solution by the marginal approach. Credit is refused to that class of .firms where the potential rate of loss is too large. All other applicants are extended normal credit terms. It is not necessary to grade the intra-marginal credit risks. The credit department needs only two basic working grades. Their major task is at the margin where it must be decided whether a customer's financial position is too shaky to extend him credit profitably.

Where should the credit line be drawn? The amount of risk a creditor can take profitably depends largely on the operating and financial position of the credit-granting firm itself. A firm with a strong net working capital position may be able, from a financial point of view, to extend credit to poorer accounts than a firm with a narrower working capital base.[14] The supplier with a strong financial cushion can absorb occasional losses on credit sales, whereas a weaker supplier may fear that a bunching of credit losses would push his own firm close to the brink.

Pure economic analysis reveals that the firm should sell up to that grade of credit risk where the probable amount of loss on uncollected accounts just equals the difference between the sales price and the firm's marginal cost. Of course, in actual operations most firms have no precise measure of marginal costs but have adopted a variety of devices which, perhaps unconsciously, roughly approximate the results obtainable by the marginal theory.

From the view of applied economics a firm having open or extra capacity may profitably sell on credit up to that grade or class of risks where the chance of loss equals the margin of profit over the estimated variable costs at the going rate of production. For example, if at the current rate of output the variable costs on a product were 60 per cent of the selling price and the credit loss in selling to a particular grade of customer was estimated at 30 per cent of the sales, sales to this group of customers would cover out-of-pocket-costs and return an additional 10 per cent to cover fixed costs and possibly profits. To be precise, the seller could actually grant credit to the marginal customers up to the exact point where the predicted rate of credit losses (e.g., 40 per cent) equaled the margin of profit over the variable costs at the given level of output.[15] However credit acceptance tightens severely when the firm is operating at or near capacity.

Ideally the credit managers' decision is mainly concerned with those cases where the financial characteristics of the customer (as determined by ratio analysis, etc.) are such as to make him appear to be close to the marginal credit risk. All firms which appear obviously stronger are extended credit, and weaker firms are denied credit terms. At the managerial level, there is often some tension between the sales manager whose goal is to maximize sales and the credit manager who wishes to minimize credit losses. As one observer noted, "If the credit manager and the sales manager do not get into an occasional fight, one or the other is not doing his job."

9. A SUMMARY OF RATIO ANALYSIS

The financial community has long calculated ratios to assess the liquidity, profitability, leverage, and efficiency of firms. Ratio calculations and analysis to summarize financial information found on the balance sheet and income statement. The investor can often easily assess the financial health of a firm by calculating the 13 ratios introduced in this chapter. Ratio analysis can be extremely useful in screening potentially poorer performing stocks, identifying problem firms, if not, bankrupt firms. The reader must be careful to compare firm ratios with its competitor firms.

Table 1. IBM Ratios, 1963–2004, Selected Years

Year	CR	AT	SR	SI	SNWK	TDA
1963	3.176	3.043	5.600	43.408	2.649	0.329
1970	1.806	1.606	4.697	20.075	4.961	0.286
1980	1.521	1.169	5.374	11.431	7.711	0.323
1985	2.280	1.529	4.737	5.834	3.419	0.292
1990	1.539	1.139	3.047	6.828	5.058	0.425
1995	1.285	1.085	3.074	11.377	7.955	0.519
2000	1.205	1.074	2.876	18.551	11.827	0.620
2001	1.209	1.086	3.178	19.950	11.695	0.578
2002	1.206	1.114	2.968	25.779	11.491	0.565
2004	1.180	1.096	3.422	29.039	13.426	0.500

Year	SA	ROA	ROTNW	ROE	TIE
1963	0.867	0.122	0.182	0.182	55.153
1970	0.878	0.119	0.171	0.171	59.442
1980	0.981	0.133	0.216	0.216	26.151
1985	0.951	0.124	0.210	0.207	26.844
1990	0.788	0.068	0.141	0.140	10.545
1995	0.895	0.052	0.196	0.188	18.548
2000	1.000	0.091	0.414	0.397	21.921
2001	0.972	0.087	0.345	0.327	49.778
2002	0.842	0.055	0.295	0.234	68.322
2004	0.881	0.077	0.414	0.284	101.19

Table 2. DD Ratios, 1963–2004, Selected Years

Year	CR	AT	SR	SI	SNWK	TDA
1963	5.412	3.257	9.056	6.901	3.370	0.064
1970	5.588	1.819	6.911	4.814	3.290	0.163
1980	2.328	1.286	6.493	6.816	5.348	0.316
1985	1.671	0.942	7.278	7.568	8.222	0.341
1990	1.220	0.732	6.400	8.115	17.968	0.411
1995	0.860	0.566	7.469	9.817	-20.658	0.493
2000	1.259	0.756	6.286	6.143	11.919	0.403
2001	1.834	1.312	6.432	5.956	3.728	0.332
2002	1.897	1.275	6.124	5.479	3.793	0.368
2004	1.915	1.360	5.623	6.124	3.780	0.379

Year	SA	ROA	ROTNW	ROE	TIE
1963	0.951	0.173	0.218	0.213	0
1970	1.014	0.092	0.131	0.128	58.327
1980	1.433	0.074	0.131	0.131	11.363
1985	1.166	0.044	0.090	0.090	9.432
1990	1.041	0.060	0.150	0.142	7.874
1995	0.983	0.088	0.411	0.401	8.465
2000	0.725	0.058	0.492	0.177	7.253
2001	0.622	0.107	0.591	0.304	6.219
2002	0.697	0.059	0.444	0.209	10.475
2004	0.771	0.050	0.289	0.160	10.487

Table 3. D Ratios, 1962–2004, Selected Years

Year	CR	AT	SR	SI	SNWK	TDA
1963	1.009	0	0	0	502.959	0.519
1970	0.679	0	0	0	-10.734	0.568
1980	0.936	0.599	7.832	11.413	-60.681	0.529
1985	0.664	0.366	8.514	8.409	-7.456	0.464
1990	0.840	0.470	11.458	10.251	-23.740	0.484
1995	0.786	0.620	7.197	20.102	-15.640	0.441
2000	0.772	0.729	3.927	28.318	-5.370	0.615
2001	0.715	0.638	5.422	18.298	-4.970	0.603
2002	0.808	0.732	3.346	16.041	-6.315	0.578
2004	0.864	0.773	4.810	13.883	-14.959	0.518

Year	SA	ROA	ROTNW	ROE	TIE
1963	0.235	0.047	0.149	1.149	7.820
1970	0.204	0.039	0.125	0.125	3.463
1980	0.326	0.037	0.129	0.129	2.298
1985	0.319	0.043	0.138	0.138	3.534
1990	0.321	0.045	0.139	0.139	3.452
1995	0.334	0.033	0.098	0.098	4.130
2000	0.315	0.014	0.118	0.059	2.641
2001	0.307	0.015	0.130	0.065	3.039
2002	0.270	0.036	0.243	0.133	4.384
2004	0.307	0.028	0.180	0.112	4.082

Table 4. IBM Ratios, ROE, DuPont Ratio, Altman Z Score and its Components, 1968–2004, Selected Years

Year	CR	TDA	SA	ROA	DuPontA	ROE	NewZ
1968	2.156	0.307	1.021	0.126	0.170	0.190	3.776
1970	1.806	0.286	0.878	0.119	0.156	0.171	3.440
1980	1.520	0.323	0.981	0.133	0.192	0.216	3.257
1985	2.280	0.292	0.951	0.124	0.182	0.204	3.279
1990	1.539	0.425	0.788	0.068	0.109	0.140	2.275
1993	1.182	0.596	0.773	-0.098	-0.228	-0.428	1.341
1995	1.285	0.519	0.895	0.052	0.128	0.188	1.890
2000	1.205	0. 620	1.000	0.091	0.207	0.397	2.008
2001	1.209	0.578	0.972	0.087	0.195	0.327	1.981
2002	1.206	0.565	0.841	0.055	0.125	0.234	1.711
2004	1.180	0.500	0.882	0.077	0.187	0.294	1.935

Table 5. DD Ratios, ROE, DuPont Ratio, Altman Z Score and its Components, 1968–2004, Selected Years

Year	CR	TDA	SA	ROA	DuPontA	ROE	NewZ
1968	3.214	0.168	1.058	0.113	0.140	0.161	4.499
1970	3.588	0.163	0.014	0.092	0.114	0.128	4.345
1980	2.328	0.316	1.433	0.074	0.104	0.131	3.433
1985	1.671	0.341	1.166	0.044	0.069	0.090	2.841
1990	1.220	0.411	1.041	0.060	0.103	0.142	2.367
1995	0.860	0.493	0.983	0.088	0.229	0.401	2.004
2000	1.259	0.403	0.725	0.058	0.113	0.177	1.872
2001	1.834	0.332	0.622	0.107	0.194	0.304	1.776
2002	1.190	0.368	0.697	0.059	0.107	0.209	1.671
2004	1.916	0.378	0.771	0.050	0.099	0.160	1.841

Table 6. D Ratios, ROE, DuPont Ratio, Altman Z Score and its Components, 1968–2004, Selected Years

Year	CR	TDA	SA	ROA	DuPontA	ROE	NewZ
1968	0.480	0.542	0.228	0.044	0.050	0.127	0.900
1970	0.679	0.568	0.204	0.039	0.043	0.125	0.746
1980	0.936	0.529	0.326	0.037	0.044	0.129	0.895
1985	0.664	0.464	0.319	0.043	0.060	0.138	1.037
1990	0.840	0.484	0.321	0.045	0.054	0.139	1.100
1995	0.786	0.441	0.334	0.033	0.046	0.098	1.081
2000	0.772	0.615	0.315	0.014	0.023	0.059	0.750
2001	0.715	0.603	0.307	0.015	0.024	0.065	0.735
2002	0.808	0.578	0.270	0.036	0.056	0.133	0.798
2004	0.884	0.518	0.307	0.028	0.047	0.112	0.780

Table 7. LU Ratios

Year	CR	TDA	SA	ROA	DuPontA	ROE	NewZ
1995	0.965	0.567	1.085	-0.044	-0.556	-0.604	1.589
1996	1.193	0.545	0.700	0.010	0.051	0.083	1.026
1997	1.164	0.520	1.107	0.023	0.107	0.159	1.763
1998	1.350	0.480	1.128	0.036	0.122	0.175	1.986
1999	1.862	0.411	0.987	0.089	0.194	0.254	2.237
2000	1.975	0.285	0.693	0.035	0.057	0.064	2.080
2001	1.583	0.399	0.632	-0.420	-0.878	-1.285	0.302
2002	1.447	0.635	0.693	-0.665	-0.121	2.498	-1.224
2003	1.542	0.673	0.537	-0.049	-0.348	0.181	-0.889

Table 8. Median Altman Z Ratio Analysis in IBES Sectors, 2004

Ratio	ALL	1	2	3	4	5
CR	1.785	1.61	3.14	2.02	1.81	1.94
TDA	0.408	0.42	0.29	0.42	0.41	0.48
SA	0.635	0.07	0.61	1.18	1.24	1.26
DuPontA	0.054	0.08	0.01	0.08	0.08	0.09
ROE	0.090	0.11	0.04	0.12	0.10	0.13
NewZ	1.796	2.02	1.80	2.59	2.64	2.64
N of Firms	5833	898	583	199	698	133
Ratio	6	7	8	9	10	11
CR	1.39	1.27	2.47	1.91	2.05	1.00
TDA	0.40	0.43	0.32	0.44	0.41	0.48
SA	0.54	0.92	0.83	0.94	1.10	0.45
DuPontA	0.07	0.07	0.02	0.09	0.09	0.05
ROE	0.12	0.11	0.05	0.11	0.10	0.10
NewZ	1.90	2.12	2.03	2.13	2.38	1.13
N of Firms	183	83	867	228	341	241

Table 9. Median Sector, Industry, and Group Medians, 2004

Ratio	Frank Russell 1000	IBM	Computers	VL Computers	DD	Chemicals	D	Electric Utilities
CR	1.648	1.180	1.196	1.674	1.916	1.548	0.881	0.983
TDA	0.415	0.500	0.504	0.443	0.378	0.482	0.518	0.426
SA	0.644	0.881	0.946	0.947	0.771	0.875	0.307	0.410
DuPontA	0.089	0.190	0.016	0.097	0.099	0.094	0.047	0.049
ROE	0.139	0.254	0.025	0.098	0.160	0.159	0.112	0.101
NewZ	2.257	1.934	1.115	2.101	1.841	1.880	0.780	1.083
N of Firms	942		3	18		21		113

Table 10. The DuPont Analysis Return, the Return on Equity, and the Determinants and Calculated Median Altman Z Scores, 1963-2004

Ratio	1963	1970	1975	1980	1985	1990	1995	2000	2004
CR	2.432	2.027	1.965	1.830	1.767	1.620	1.727	1.672	1.703
TDA	0.392	0.473	0.497	0.498	0.473	0.491	0.458	0.457	0.408
SA	1.283	1.205	1.267	1.231	0.995	0.999	0.900	0.696	0.635
DuPontA	0.062	0.061	0.060	0.074	0.054	0.04	0.058	0.037	0.054
ROE	0.110	0.100	0.104	0.128	0.096	0.107	0.097	0.074	0.090
NewZ	2.992	2.659	2.756	2.966	2.321	2.131	2.227	1.806	1.796
N (for Z)	1064	3524	5389	5444	6239	6107	7972	7826	5633

Notes

[1]Although only a fraction of net working capital is likely to be in cash, an adequate amount of net working capital assures a substantial short-term cash flow and serves as a good base for short-term credit.

[2]$dTC/dQ = i/2 - tCu/Q^2 = 0$,

$i/2 = tCu/Q^2$

$$Q = \sqrt{2\,t\mathrm{Cu}/i}$$

[3]Thus Miller and Orr minimized total costs:

$$\min \varepsilon\,(dc) = \frac{\gamma m^2 t}{zZ} + \frac{\upsilon(Z + 2z)}{3} \quad (7)$$

$$\frac{\partial \varepsilon(dc)}{\partial z} = -\frac{\gamma m^2 t}{Z^2 z} + \frac{2\upsilon}{3} = 0 \quad (8)$$

$$\frac{\partial \varepsilon(dc)}{\partial Z} = -\frac{\gamma m^2 t}{Z^2 z} + \frac{\gamma}{3} = 0 \quad (9)$$

[4]As additional ratios are used, one soon discovers that the same information is being presented in a different form.

[5]This means that these companies, in effect, carry no net working capital.

[6]The turnover figure, however, cannot necessarily be improved before the event by raising markups, since such an action might reduce total sales. The insights of economic theory are useful at this point. The effect of the markup on the sales/inventory ratio depends on the relative inelasticity of the firm's demand.

[7]The larger the percentage of ownership capital in the financial structure the less will be any difference between rate of net profit on equity and the rate of net profit on total assets.

[8]Intangible assets, such as good will, should be subtracted from the book value of the common equity.

[9]See Chapter 9 for a detailed analysis of this ratio and its variants.

[10]In summer 2002, the Altman Z Score problem on the Advanced Financial Management exam featured the calculation of the Lucent Technologies Z Score. The students were asked to "guess" the firm. The exam silence was interrupted by a Lucent employee, who calculating the score, exclaimed "My god, that's my firm!". Lucent has outperformed the S&P 500 by a substantial margin, since June 2002. Lucent's beta is 2.56, so its reward to volatility is twice as high as the S&P 500 for the June 2003- October 2004 period. Not all models work for all firms, at all times, as the reader will see in Chapter 14.

[11]Ratio analysis and related techniques are often called credit analysis.

[12]The banks, which have a lower margin for risk, obviously have to restrict their credit more severely than suppliers. The following discussion applies mainly to trade credit.

[13]If the loss experience in a given credit grade is to be fairly predictable, the classes have to be made quite large. Very fine grades might be useful for the purpose of finding the exact credit cut-off point. But they decrease the predictability of the results in each class.

[14]In some cases where immediate financial risks are high but the possibilities of good profits exist in the buying firm's activities, a supplier in a strong financial position has on occasion purchased some of its customer's common stock as well as sold to it on credit. This gives the supplier an opportunity to obtain possible compensating gains to offset the credit risk. The use of convertible securities is an analogous situation.

[15]No net profit might be made out of selling to this group, but we presume there would be profits on the sales to all the firms that were intra-marginal as far as credit loss probabilities are concerned.

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Problems

1. Obtain the latest annual report for Microsoft (MSFT), and calculate the current ratio, acid test ratio, total debt-total assets ratio, sales-to-assets ratio, and return on equity ratios. Compare the MSFT ratios to the corresponding ratios of the S&P 500 securities, commenting on the MSFT liquidity, profitability, debt, and asset efficiency measures. What is the Altman Z of HP?

2. Management is interested in restructuring the firm. Mr. Dynamo, a recent MBA, argues that an efficient method to enhance the firm's ROE and Altman Z-score is to sell-off the firm's unprofitable divisions. Evaluate Mr. Dynamo's hypothesis.

Chapter 6

FINANCING CURRENT OPERATIONS AND THE CASH BUDGET

A firm with increasing sales volume needs increased current assets to service the new level of activity. Given normal inventory turnover, higher sales necessitate a higher level of stocks. Similarly, greater sales levels enlarge the average amount of receivables the firm carries, since additions to the accounts come in faster than old accounts are collected. The corporation officers responsible for working capital management must decide how to finance the required increase in current assets.

A temporary or seasonal rise in activity may be financed with short-term or "temporary" sources. The additional gross working capital required can be acquired by an increase in suppliers' credit, negotiating a bank loan, or selling open market commercial paper. The use of short-term financing neither adds to nor detracts from the absolute amount of a firm's net working capital. The working capital ratios, however, decline, indicating an increase of risk in the firm's current position. Table 1 illustrates the effect on the working capital position of a firm when an increase in inventory is financed with short-term debt, specifically with a bank loan. The current and acid test ratios decline and the net working capital turnover rises to what might be a dangerous level. The working capital position of the company would be considered rather risky if it maintained these proportions in its current accounts for any length of time.

However short-term financing is comparatively cheap and flexible, and may be used with relative safety under any of the following conditions:

1. The growth in sales is temporary or seasonal.

   Under these circumstances, at the end of the peak period sales decline, with a resulting decline in the level of inventory required. As sales slacken, more old receivables are collected than is added in new accounts. The funds released from inventory and receivables can be used to repay current liabilities and restore the firm to its original (or, if there are profits, a better) working capital position. Nevertheless, even if the need £ for more current assets is expected to be temporary, using much additional short-term financing is dangerous if the starting level of net working capital is inadequate.

Table 1. Effect of a Bank Loan on the Working Capital Ratios

Working Capital Position before Bank Loan

Cash	$50,000	Accounts Payable	$100,000
Receivables	100		
Inventory	100,000		
Total Current Assets	$250,000	Total Current Liabilities	$100,000

Going Level of Sales $1,500,000

Net Working Capital	= $150,000
N.W.C. Turnover	= 10
Current Ratio	= 2.5
Acid Test Ratio	= 1.5

Working Capital Position after Bank Loan

Cash	$50,000	Accounts Payable	$100,000
Receivables	100	Bank Loan	100,000
Inventory	200,000		
Total Current Assets	$350,000	Total Current Liabilities	$200,000

Going Level of Sales $2,000,000

Net Working Capital	= $150,000
N.W.C. Turnover	= 13.33
Current Ratio	= 1.75
Acid Test Ratio	= .75

2. The firm holds substantial net working capital.

If the firm has a strong working capital position, it may be able to use some additional short-term financing with impunity. The resulting changes in the working capital ratios would merely bring them down to the standard or “normal” range. Within limits the firm can safely finance an increase in operations without using any new long-term financing.

3. The operating margin over variable costs is high.

A good profit margin over out-of-pocket costs may permit the firm to maintain its working capital from the operating profits on the increased sales. Whether this can be done depends on the comparative rate of fund inflow, the rate at which new assets are required, and the path of the rising sales curve. If the latter shows a short rise and then plateaus, the high profits may soon restore the working capital position that existed before the rise. If, however, there is no period of consolidation, profits alone may not be sufficient to furnish new net working capital at the desired rate. Relying on profits during a period of growth as the source of net working capital constrains the firm to a careful budgeting of new fixed asset acquisitions. Moreover, such a policy is likely to keep dividend payouts niggardly.

Paradoxically, a firm finds the most pressure against its current financial position during periods of rising activity (and periods of sharp losses). In periods of mildly declining activity, the funds released by the decrease in current assets can be used to repay current debt. As long as the current ratio exceeds 1:1, an equal decrease in current assets and current liabilities improves the working capital ratios. Thus, unless significant losses are experienced in realizing the current assets, the firm develops increased operating liquidity.[1]

On the other hand, the conditions for the financial ruin of a firm are often set during the upgrade. If financial planning is lax and if the management fails to provide adequate working capital, the company's current position can be weakened as its sales increase. A company whose current and acid test ratios are low and whose volume of business is high relative to its net working capital is "overtrading." A relatively minor economic reverse – the failure of a large account receivable or a drop in inventory values – can bring the firm to financial disaster. The reader is reminded of the Altman Z score and its predictive power in identifying potential distressed firms.

1. SOURCES OF SHORT-TERM FINANCING

Almost all firms make some use of short-term financing. It is comparatively cheap and relatively available. It may be obtained quickly and conveniently; some kinds of short-term financing are supplied practically automatically. (Among these are trade credit, and expense and tax accruals.) The major types of short-term credit are trade credit, bank credit, open market commercial paper, finance companies, and factors. The order in which these are listed is largely based on the prevalence and volume of the type of credit as used by the nonfinancial firm. Trade credit is part of almost every firm's financial structure because credit is customarily given on almost every commercial sale. Bank credit is available to sound firms of all sizes and is used frequently. The use of commercial paper is restricted to large firms of good standing. Commercial paper is one of the credit instruments traded on the "money market."[2] The total volume of credit supplied by the finance companies and factors is quite large, but although its use is spreading, it is not widely used outside a few industries.

1.1 Trade Credit

Trade credit, also called suppliers' credit, open book account or ledger credit, develops because most commercial purchases need not be paid for immediately. During the period the purchasing firm has the goods but has not yet made payment, some part of its operating assets are being financed by its "creditor." On the books of the purchaser the balance of not-yet-paid suppliers' bills is carried as accounts payable.

The length of time the purchaser has before payment and the discount, if any, for prompt or early payment are called the "terms." Credit terms vary according to the customs prevailing in different industries or lines of trade. One type of terms which is growing more common is the single statement or end-of-the-month billing terms. A popular single-statement term is customarily written "2/10 e.o.m. n/30." All purchases made during the current month appear on the statement of the first day of the following month. If the purchaser pays the bill within ten days after the end of the month (e.o.m.) in which he made the purchase, he may take 2 per cent off the face of the bill as a cash discount or reward for prompt payment. If the purchaser fails to pay during the first ten days of the month, the gross amount is due at the end of the month (i.e., net/30).

Single-statement terms save the seller booking costs and billing problems, since he can consolidate the billing for sales during a month on a single statement. The cash discounts are actually less a reward for prompt payment than a penalty to the slow payer for the worry and extra risk put on the seller.

Open book credit is a cheap source of funds if the bills are paid within the ten-day end-of-the-month discount period. A purchaser who buys at the beginning of the month has 40 days in which to pay his bill and still receive his 2 per cent discount. (As a matter of fact, the buyer may have upwards of 45 days of free credit, since a purchase made after the twenty-fifth of the month usually does not appear on the statements until the end of the following month.) If the discount credit period passes, however, the purchaser should consider the loss of the discount a cost of receiving credit for only the additional 20 days from the tenth until the end of the month. This loss of the 2 per cent discount comes to a high rate when reckoned on an annual basis. The payment of 2 per cent for use of funds for 20 days is equivalent to an annual simple interest charge of 36 per cent.[3]

A firm that foresees difficulty in meeting the cash discount period on its payables should, if it can, arrange a bank loan or alternate source of credit. (The cost of a bank loan is hardly likely to be more than 6–10 per cent per annum, and perhaps the cost of factoring may run 12 per cent. The cost in lost cash discounts may amount to 36 per cent per annum or even more in some lines of trade.) However, some firms do not consider the lost cash discount as amounting to the equivalent of as much as 36 per cent a year because in practice they delay payment beyond the whole term period. Of course the firm is breaking the credit terms and is considered a delinquent or slow payer. Creditors may forgive such behavior if it happens infrequently. But frequent abuse of credit terms becomes known in the trade and the habitually delinquent firm may find its credit curtailed. It will not receive the best service, and some suppliers will not deal with it at all except on a cash basis.

1.2 Bank Credit

Types of Bank Loans Although commercial banks place funds in government and corporation bonds, purchase mortgages, and make personal loans, their prime function – one they are uniquely equipped to perform – is to make commercial loans.[4] The classical business or commercial loan is a short-term (30-to-90-day) grant of credit to a business unit to enable it to cover temporary gross working capital needs. A forecasted or planned event – i.e., a seasonal tapering off in activity that releases funds from inventory and receivables, or the development of long-term financing – will provide the firm with the money to repay the loan.

Although it is general bank policy to assume that all commercial loans will be paid out of the business' cash-generating capacity, there are two classes of loans, secured and unsecured. The unsecured loan is granted merely on the general credit of the firm; the secured loan is backed by a lien against a firm asset, by the pledge of the credit of some person in addition to that of the business, or by a lien against some personal assets of those connected with the business.

One type of secured loan is based on a lien against inventory. Inventories constitute a good collateral for loans when the goods are homogeneous in nature and unspecialized, and where there is a going market (preferably organized) and the market price of the goods is relatively stable. Sometimes banks make loans against warehouse receipts. The inventory is held in a public warehouse and the goods may not be withdrawn from the warehouse by the firm without the countersignature of the properly designated bank official. As any part of the goods is withdrawn, a proportionate amount of the original loan is repaid.

Some bank loans are secured by a lien against the firm's outstanding receivables. If the firm fails to repay its loan, the bank may try to satisfy its claim by collecting the accounts receivable for itself. This is, of course, a last resort; before granting the loan the bank tries to ascertain whether the borrowing firm can repay out of its regular operations. The asset pledged as security is only an additional safety feature which may help to reduce the bank's losses if the loan is not repaid as expected. The bank, however, may set the terms of the loan so the company will have to pay back part of the loan as the pledged accounts are paid. This keeps the proportion of bank debt to the value of the assets pledged constant over the life of the loan.

Many business loans are backed by the pledge of personal assets of the owners as collateral. The assets are usually liquid that is, marketable securities, cash values of insurance policies, savings accounts, etc. In a personal proprietorship these personal assets of the owners may furnish eventual backing for business debts, but only after the personal creditors are satisfied; moreover, all the general business creditors may look to the net personal assets. However, the direct pledge of personal assets as collateral gives the bank the first claim against these assets. The personal holdings of corporation owners are not normally within the reach of the business creditors. In a smaller company this is not always an advantage, for it can restrict the amount of credit available to the firm. Often, then, the principal officers or major stockholders of a closely held corporation may pledge personal securities, savings, or other assets to help obtain a bank loan for their company.

Some loans are made on a co-signer basis. Some party other than the one primarily liable assumes contingent liability on the debt, or guarantees the loan in case payment is not made as agreed. Friends and business acquaintances of the owner sometimes co-sign a promissory note along with the proprietor of a small business. A supplier may co-sign to help a new but growing customer establish bank credit. A parent company may sign or endorse the note of a subsidiary. In a family or closely held corporation the principal officer may sign personally as well as in his capacity of agent for the corporation. In so doing, he waives his limited liability and pledges his personal credit at least for the amount of the particular debt. In general, as far as the bank is concerned, the effect of a co-signer loan is to bring in the credit and resources of another to help buttress the inadequate position of the original applicant for the loan.

A firm usually prefers to receive an unsecured loan rather than any of the varieties of secured loans. Receiving an unsecured loan is an implicit acknowledgment of a high credit rating. Moreover, although a secured loan does not change the overall situation of the other creditors, as shown by ratio analysis, from what would exist if an unsecured loan had been obtained, it does segregate a group of assets for the prior benefit of the secured creditor in the event financial difficulties should occur. Less desirable assets are thus left for the general creditors, and the rate of loss they could suffer may be higher than that of the secured creditors. If the general trade creditors know that a solid asset is pledged for a bank loan, they may be cautious in extending additional credit to the firm.

The foregoing analysis does not imply that incurring a bank loan normally weakens the general creditors' position. Ordinarily, the proceeds of the bank loan are used to reduce accounts payable or accruals. The remaining claims are in no worse position than before, since the total debt is the same – only some of it has been transformed into bank debt.

Cost of Bank Credit. The cost of bank credit varies with the size and credit standing of the firm and according to the general level and the shape of the market structure of the interest rate. The prime rate is the lowest commercial loan borrowing rate and is set by the banks in the large cities as the charge for their biggest and soundest customers. The average interest cost is lower on a large loan than on a smaller one, because administrative, bookkeeping, investigating costs, etc., are more or less fixed and do not vary with the size of the individual loan. Also, the credit risk tends to be higher for smaller concerns. For a given class of customers the commercial loan rate is generally lower than the capital market rate (effective bond interest rate), because the bank loan rate belongs to the class of short-term interest rates, and in a normal market the interest rate curve is lower at the shorter maturities.[5] The commercial loan rate tends to be low, of course, during periods of slack demand for funds and when the monetary authorities are pursuing an easy money policy; the rate is higher during times of credit stringency or tight money.

Not only is the commercial loan rate usually a notch below the effective capital market rate, but the use of bank borrowing in lieu of a bond or debenture issue avoids flotation costs, the legal and administrative costs of drawing up the indenture, and the administrative costs (if the issue requires it) of registering with SEC. Furthermore, a bank loan may be more closely tailored to the firm's requirements in contrast to a capital market issue; a bond issue, for example, is often floated ahead of the company's need for funds, thus requiring the firm to pay interest on the debt in the meantime. A seasonal inflow of funds can be used to extinguish bank debt and reduce the interest costs when the borrowed capital is not needed. If, however, the debt is a debenture or bond, the firm is not likely to make retirements out of seasonal funds, and interest payments continue. Of course, the net interest cost is somewhat reduced by the earnings on the short-term investments the firm can make in the interim.

On the other hand, although long-term capital may be costlier, its advantages over bank credit lies in its semi-permanence – the lack of continuous current pressure on the firm gives management the opportunity to forecast and plan further into the future. Thus, many firms may prefer to fund (i.e., use long-term sources) as much of their current debt as possible, relying on bank credit for perhaps a small part of the peak of their seasonal needs. Such firms may have excess funds off season, but capital costs can be reduced by placing seasonally redundant funds in such eminently secure short-term money market investments as treasury bills, tax certificates, marketable commercial paper, etc.

The interest cost on a commercial loan is usually computed on a simple interest basis for the life of the loan. Thus, if the interest rate is 5 per cent per annum, the interest charge on a $100,000 loan for 60 days will be $833.33 (i.e., 5/6 per cent of $100,000 for 60 days equals 5 per cent interest on an annual basis). Where the amount of loan outstanding varies from day to day the charge may be set up on a per-diem basis so that the lender pays only for the funds he actually uses. In making most loans, however, the bank discounts the note (i.e., the negotiable legal evidence of debt) and thereby earns a rate slightly above that of simple interest. When a note is discounted, the bank subtracts the interest for the term of the loan in advance and extends to the borrower the difference between the face amount of the note and the interest. In other words, the borrowers have the use of slightly less than the face value of their loans, and the bank retains the discounts which makes the interest charge minutely higher. The extra amount brought in by discounting rather than straight interest charges is relatively small.

Another device used by banks to vary the effective interest charge is the compensating balance. Traditionally the compensating balance has been set at 20 per cent, which means that a successful applicant for bank accommodation is requested to keep 20 per cent of his loan on deposit at the bank over the life of the loan. Although this requirement has been often cited as a safety measure, its actual effect is to raise the rate of interest on the usable portion of the loan.[6] To the extent the compensating balance exceeds the firm's normal cash balance, the effective interest cost on the loan exceeds the nominal rate. The use of the compensating balance is no longer a fixed custom. During times of easy money when the banks have considerable free reserves, no compensating balance is requested of prime borrowers. At other times, the percentage of compensating deposit required varies with conditions on the money market and the general credit standing of the borrower. Although a compensating balance is no longer an invariable condition, it is generally expected that the borrower will keep his normal working balance at the bank that accommodates his credit needs. Usually a bank tries to meet the credit needs of its own depositors before financing other applicants.

Line of Credit. The term line of credit is used in three different but related meanings. Suppliers may set a line of credit or credit limit for individual customers. This is the amount of outstanding trade credit they are willing to allow before cutting off further sales or reviewing the account. If the customer knows what the amount is, it is called an explicit line of credit; an implicit credit limit exists when the amount set by the suppliers' credit manager is not made known to the customer.

An open or general line of credit exists when a large corporation makes an agreement with its banks for a specified amount which the company may borrow at any time during a specified period, perhaps a year. The line of credit is subject to review and renewal at the end of the period. The firm is charged interest at the going commercial loan rate only for the time any loan is outstanding and only for the actual amount of the line of credit used. The firm usually pays an additional fee for the whole line of credit over the year – whether used or unused-since the bank obviously has to restrict its investment policies to have the standby credit available.

A seasonal or temporary line of credit with a bank provides a company with funds for its peak needs. The firm has only to pay interest on the funds it actually borrows, but the bank is morally committed to have the funds available. The amount of a seasonal line of credit is generally determined by drawing up a cash budget (i.e., a short-term cash forecast of the firm's operations). This not only enables the negotiators to project the firm's likely maximum cash needs, it also provides a quantitative framework to ascertain how the firm will develop the free funds to repay the bank debt after the operational peak is over.

Borrowing in Anticipation of Permanent Financing. Bank credit is a simple and quick method of raising funds. Thus, it is often used as a temporary method of financing until the firm determines how much permanent financing it needs, decides upon the best type of security to float, or organizes the floating of an issue. Thus, a utility firm may use bank financing to begin an addition to plant, and after the final cost is determined, float new bonds to retire the bank debt. A firm with access to the capital markets may be caught in a sudden wave of expansion and finance its increased activity with bank borrowings until it can organize a long-term security issue. The bank may lend money to recognized companies that already have issues traded on the secondary markets, with the full knowledge that the debt is to be retired by the issue of additional stocks or bonds.[7] In some instances, the security issue may be an afterthought. Both parties may have thought the debt would be paid out of the cash flow and underestimated the time period for which the new financing was required. When it becomes apparent that the firm cannot clear up its bank debt without curtailing profitable opportunities and the banks are reluctant to supply long-term capital, the management will seek other financing to repay the bank. If the bank debt is repaid out of the proceeds of a bond issue, the whole process is called funding the debt.

The sequence of bank credit to permanent financing may work quite well for the firm already established on the capital markets. The pattern also describes a major reason why a firm may venture out with its first public issue. But for many firms the link between the money markets and the capital market is broken. Because they are small, or new, or for other reasons, these firms cannot make the transition to the capital markets easily or cheaply. The company may have outgrown the resources of its owners, and it may have opportunities that the commercial bankers recognize, but which they are unwilling to finance because funds would be committed over too long a term.[8]

1.3 Other Forms of Short-Term Financing

Open Market Commercial Paper. Open market commercial paper is the term for the short-term negotiable notes with maturities from about one to nine months that strong corporations float on the money markets. Open market paper is moved onto the market by commercial paper dealers, who sell the issue to insurance companies) pension funds, business corporations, and smaller commercial banks for the short-term investment of their liquid reserves.[9] It is an important fund-raising device of the large commercial finance companies.[10] In total the amount of finance company commercial paper floated is about double the amount floated by all other kinds of companies combined.

The rates on commercial paper are generally below the prime loan rate but somewhat above the prevailing rate on treasury bills of the same maturity. The advantages to the lender in buying commercial paper is its ready availability in convenient maturities and its minimal administrative detail and costs. The advantage to the borrower is that the wide distribution his paper may obtain in what is essentially a nationwide market frees him from relying on local bank resources and provides him with lower net interest rates. On the other hand, the use of commercial paper does not establish personal rapport with the bankers, who may sometimes advise and support the firm through temporary hard times. Neither does the use of commercial paper lend itself to easy change of terms and renewal as is sometimes possible with a bank loan. The total volume of commercial bank loans far exceeds the funds raised by issue of commercial paper, although the latter is by no means negligible.

Finance Companies and Factors. The large commercial finance companies are the department stores of the financial world. Initially adjuncts or subsidiaries of the automobile companies, their major business still consists in discounting dealer sales paper and financing dealer automobile inventories. Branching out into other financing areas, the large companies usually have a personal finance subsidiary and an account receivable factoring subsidiary. They finance major furniture and appliance dealers both for inventory and on installment receivables, and they may do some direct sales financing themselves. In many activities the finance companies compete with the commercial banks. Although their charges may be higher) the finance companies often benefit from closer contact with the dealers) specialization that enables them to act efficiently and quickly, and the willingness to take more risk than the bank. A large percentage of the funds which the finance houses dispense are raised through the banking system-either by the establishment of lines of credit with large banks or by the sale of open market paper, a large percentage of which is picked up by the banks outside of New York.

Factoring is an important source of financing in the textile and garment trades, and also appears in leather goods, sporting goods, and lumber trades, among other industries. Many factoring companies are today subsidiaries of the major finance companies. Factoring arrangements are based on an advance of funds by the factor against an assignment of trade receivables. The factor’s relation with the company is governed by an underlying agreement which can be varied to meet different circumstances. Generally, the factoring agreement is not a one-shot deal but a continuing arrangement; the company’s debt to the factor is decreased as the assigned receivables are collected, but new debt is created as the receivables arising out of new sales are surrendered to the factor for immediate funds. Usually the factor provides cash up to about 75 per cent of the firm’s accounts receivable. In certain cases, however, the firm may be given the privilege of assigning up to 85 per cent of its accounts if it pays a higher financing charge for the last 10 per cent.

Factoring arrangements are either recourse or nonrecourse. In a nonrecourse factoring agreement the factor buys the accounts outright and cannot collect from the selling company for any losses on defaulted accounts. Of course the factor advances only about 75 per cent of the face of the accounts, and this gives him some margin to cover losses.[11] Moreover, in nonrecourse factoring the factor has the right to reject accounts that do not meet his credit standards. In factoring with recourse, the factor does not take the loss on bad accounts; the borrowing firm makes good on all noncollected receivables. The financing costs are generally lower on the recourse agreement.

Factoring agreements are also classified as being on a notification or non-notification basis. In a non-notification arrangement, the firm's customers are not necessarily told of the factoring agreement, and they continue to send their payments to the office of the selling firm. Here the receipts are segregated, and the proper share turned over to the factor. The borrowing companies generally prefer a non-notification basis. When the accounts are on a notification basis, the customers are instructed to send their payments directly to the factor. The factor, of course, applies these receipts against the selling firm's indebtedness. Under a notification, nonrecourse basis, the factor often in effect operates the selling firm's credit department. He makes the initial credit analysis on a sale, takes charge of collections, and follows up on bad accounts.

Factoring charges are usually based on the firm's daily balance. Depending on the level of the general interest rate, the specific factoring agreement, and the credit standing of the selling firm and its customers, factoring rates may run from something below 1 per cent to 3 per cent per month. These relatively high charges, however, compare favorably with the customary cash discounts running as high as 8/10 n/60 in some trades where factoring is common. Factoring costs, of course, run higher than the bank loan rates; but a factor takes risks the bank will not, and many of the services a factor performs are not available at the banks.

Factors are heavily used in industries where entry of new firms has been comparatively easy and where many companies are short of working capital. Thus, although the use of factoring does not weaken the financial position of the firm, its customary use by companies with inadequate initial capital has sometimes led to the mistaken notion that factoring is a "last-resort" type of financing. In spite of this psychological drawback, factoring is a useful and convenient method of speeding up the cash cycle for many business firms.

2. THE CASH BUDGET

Short-term borrowing is generally arranged on the anticipation that the normal operations of the business will create enough "cash throw-off" to retire the debt. The cash budget is a device for making the assumptions behind this anticipation explicit. The cash budget is a short-term forecast of the firm's cash operations. It shows the items that will absorb funds as activity rises, and it indicates how cash will be made available to retire current obligations after the peak need is over.[12]

Since the cash budget estimates the firm's short-term needs for cash, it is extremely useful in arranging bank loans and seasonal lines of credit. However, our purpose in presenting the cash budget here transcends its practical value as a tool of financial planning. The cash budget serves as a clear expository device depicting the absorption and release of funds as the pulse of business operations surges upward and then slackens.

The following information or estimates, broken down by the relevant time periods, are needed to construct a cash budget:

1. A forecast of sales, broken down into the probable proportions of cash and credit sales.

2. An estimate of purchases coupled with information on customary credit terms.

3. The estimation and construction of a function relating the volume of cash collections to the amount of outstanding receivables.

4. An estimate of out-of-pocket charges (or cash operating expenses) for the period ahead.

For illustration suppose we construct a cash budget to apply to the following problem: You are the treasurer of Optical Supply Manufacturing, Inc. You are about to negotiate a credit limit at the bank for your seasonal operating needs.

Schedule A		Schedule B	
Estimated Purchases		Estimated Sales	
1st month	150,000	1st month	100,000
2nd month	200,000	2nd month	150,000
3rd month	25,000	3rd month	250,000
4th month	25,000	4th month	200,000
(Terms on purchase 8/10 e.o.m.)		(Terms of sales 2/10 e.o.m. n/30)	

Some significant accounts at the start of the season:

Cash	$10,000
Accounts Receivable	50,000
Accounts Payable	40,000

It is estimated that about 80 per cent of the accounts receivables of the preceding month are collected each month. About 90 per cent of the collections obtain the cash discount. Variable expenses are 20 per cent of each month's sales. Staff salaries and other administrative expenses run $10,000 per month. Depreciation on equipment is $5,000 per month.

Table 2 depicts the construction of a cash budget based on the information given on the Optical Supply Manufacturing Company. Although all the figures on the budget appear solid, it is important to remember that the whole schedule is built on a forecast of short-term sales, an estimated purchase schedule related to these sales, and a cash collection estimate based on past experience of the relation of cash payments to the receivable balances. If any of these factors deviate from expectations, the budget will be more or less imprecise. Of course, a budget is not sacred and is subject to revision to conform to developing facts. It is a guide to intelligent action, not a fixed concept.

Table 2. Cash Budget of Optical Supply Manufacturing, Inc.

	1st Month	2nd Month	3rd Month	4th Month	5th Month
Accounts Receivable, beginning of the month	50,000	110,000	172,000	284,000	256880
Gross collections for the month (80% of the above)	40,000	88,000	137,600	227,520	205,500
	10,000	22,000	34,400	56,880	51,380
Sales (estimated per schedule B)	100,000	150,000	250,000	200,000	n.a.
Accounts Receivable – end of the month	110,000	172,000	284,400	256,880	n.a.
Cash receipts:					
Net cash collection after discounts (98.2% of the gross collections)	39,280	86,416	135,123	223,425	201,805
Estimated Cash Disbursements:					
Payment of Trade Accounts – less discounts	36,800	138,000	184,000	23,000	23,000
Variable Expenses (est. for mo. 5)	20,000	30,000	50,000	40,000	30,000
Administrative Expenses	10,000	10,000	10,000	10,000	10,000
Total Disbursements	66,800	178,000	244,000	73,000	63,000
Net Cash Gain or (Outflow) for the month	(27,520)	(91,584)	(108,877)	150,425	138,805
Starting Cash 1st month	10,000-				
Cumulative Cash Position (deficit)	(17,520)	(109,104)	(217,981)*	(67,556)	71,249

*Peak forecasted cash needs. Probable line of credit around $230,000.

According to the Goldman Dress Manufacturing, Inc. budget, the peak need for cash will reach approximately $218,000. This estimate is based on the assumption that payments for the purchases and receipts from the receivables will come in about the same time during the month. For some companies payments are customarily concentrated at the beginning of the month and receipts come in evenly throughout the month. It is possible to have an intra-monthly peak which, though it exists but a short time, must be covered. In such a case, the time periods upon which the budget is constructed should be made shorter than a month so that the peak need for cash is clearly indicated.[13]

The information given in the Optical Supply Manufacturing Company example included depreciation charges of $5,000 per month. The reader might note that this item is extraneous and was not used in constructing the cash budget.

Although data were not specifically given for the fifth month, the major cash flow items affecting the fifth month were implicitly contained in the information presented. The estimated cash flow for the fifth month is particularly interesting, for it shows the company well out of temporary debt with cash holdings of $71,000 – approximately $60,000 more than at the start of the season. This does not necessarily mean that the company will make a profit for the year's operation, or even for the season. Since there are other expenses or incomes which may be noncash in nature, the cash flow for any short-term period seldom corresponds to the usual definition of profit or loss. However, in constructing a budget even for so simplified a case as the Optical Supply Manufacturing Company, we can observe how the slackening activity led to a net cash inflow more than sufficient to repay the indebtedness built up at the height of the seasonal operations. Thus we have an illustration of the argument presented at the beginning of this chapter.

If a cash budget shows that the firm's increasing activity is long run so that the repayment of short-term borrowing might prove difficult, the management may consider raising longer-term capital-funding the short-term debt. Of course, it must determine whether moving to this new, more permanent level of activity is profitable. A firm does not have to increase its activities if there is no economic gain in it. If the firm decides to use more permanent financing, the factors of cost, risk, and the existing financial structure will determine the type of issue.

The cash budget problem has been presented here in isolation. Using the information given, one may determine that the Optical Supply Manufacturing Company should apply for a seasonal line of credit with a maximum (allowing for possible minor miscalculations) of about $230,000. In the context of our little example, the other circumstances of the Optical Supply Manufacturing Company's financial position can be assumed to support this conclusion as the best course of action. On the other hand, suppose the financial structure of the Optical Supply Manufacturing Company was already risky. Then the firm should try to arrange additional long-term financing carry a bigger net working capital balance and reduce the amount of its necessary seasonal short-term borrowing. If this procedure were to lead to an unduly heavy cash balance in the off season the excess funds can earn a return (albeit low) by investment in the money market.[14]

The cash budget – like other tools of financial analysis – is not an end in itself but merely a guide to understanding. Comprehending the financial problems of a firm may require the use of more than one method of analysis. When, however, these methods overlap or duplicate the same information, the simplest tool adequate to the problem is preferable.

Notes

[1]In the early stages of a sales downturn, the firm may accumulate unintended inventory. The firm will cut current purchases to restore the inventory to a more "normal" relationship to sales. Adequate net working capital is important to bring the firm through just such transitional situations.

[2]In the broadest sense, the money market may be defined as the broad complex of institutions extending, dealing in, and using short-term money credit. It refers both to the dealers in short-term credit obligations and the debt instruments and types of loans customary on the market. The operations of the money market set the structure and level of the short-term interest rates. The center of its activities in the United States is New York City, although its eventual scope is nationwide and even international. Among the major suppliers of funds to the money market are the banks, insurance companies, other financial institutions, and corporations having temporary excess funds. The important rates set on the money market are the rates on short-term treasury bills, commercial paper, bankers' acceptances, prime commercial loans, and margin loans to brokers on security collateral. The rates on the capital and money markets are related.

[3]I.e., 20 days goes in 360 days 18 times (18 X 2% = 36%).

[4]As of December 31, 1960, commercial loans totaled \$42.4 billion and constituted 80 per cent of aggregate earning assets of all commercial banks in the United States. As of December 2002, commercial loans totaled \$965.3 billion.

[5]See Chapter 9 for a discussion of this phenomenon.

[6]On a loan granted with a compensating balance, the bank is able to keep some proportion of its reserves otherwise committed to the loan. This savings in reserves can be lent to another borrower with a subsequent increase in the bank's earning power.

[7]This seems to establish another advantage to having a publicly traded issue. The firm not only has access to the capital markets but has a better rating in the money market in addition.

[8]The small business investment companies growing out of the Small Business Act of 1959 were hopefully designed to fill this gap in our financial institutions by providing capital to intermediate-size firms.

[9]The spread received by the dealers for floating the notes is very low, but since the issues are large and the issuing firms have the highest credit standing, marketing problems are not difficult.

[10]In 1960 about $3.5 billion of finance company commercial paper outstanding was placed with insurance companies, corporations, or other large buyers without passing through the dealers and the open market. By December 2002, the commercial paper market had grown to $1321.5 billion, of which $1167.5 billion was finance and $154 billion was nonfinance. Source: U.S. Federal Reserve (www.federalreserve.gov).

[11]When the account is collected in full the 25 per cent coverage belongs to the seller; it is either returned to him or used to reduce his balance at the factors.

[12]If the cash budget indicates that the firm will require funds for a longer term, the management should, if it can, arrange more permanent financing.

[13]A budget can be made to cover the first third of every month and then the last two-thirds. This is useful, if there is a peak need around the tenth of the month.

[14]Many large corporations are suppliers of funds to the money market, investing temporarily idle cash in commercial paper, bankers acceptances, etc. – but above all in short-term U.S. Treasury notes and bills. In the past, short-term corporate investment funds often went into "call loans" to stock brokers. In 1929, an exceptionally large amount of these corporation funds helped support the excesses of the stock market by supplying cash for margin loans to speculators. Member banks were prohibited from placing "call loans" for nonbank lenders in 1933.

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Problems

1. The controller of the Largay Corporation wished to estimate his cash needs for the coming six months. The controller, his salesmen, and production men constructed the following sales and purchase and operating expense schedule.

Month	Estimated Sales (all on credit)	Estimated Purchases	Estimated Direct Manufacturing Costs
1	300,000	250,000	60,000
2	500,000	300,000	100,000
3	600,000	300,000	120,000
4	600,000	200,000	80,000
5	400,000	150,000	60,000
6	300,000	150,000	

The company had cash expenses of about $45,000 a month in administrative and overhead costs. The controller also had the following cash obligations to meet:

a. In month 3 a tax payment of $160,000.
b. In month 4 a semiannual interest payment of $20,000 plus $40,000 for the sinking fund.
c. In months 3 and 6 regular quarterly dividends of $30,000 per quarter. Standard terms for the Largay Corporation sales were 2/10, n/30

e.o.m. The Largay Corporation received terms 3/10, n/30 e.o.m. on its own purchases. The controller estimated that about 75 per cent of his accounts receivable were collected the following month. About 80 per cent of the collections were entitled to the cash discount.

The working capital accounts at the beginning of the six month period were as follows:

Cash	$250,000	Accounts Payable	$300,000
Accounts Receivable	360,000		
Inventory	600,000		

The controller wishes to maintain a minimum cash balance of $200,000. Since his collections and the bulk of his payments come about the same time of the month, he foresees no intra-monthly difficulties.

Construct a cash budget for the controller so that he can estimate his financing needs for the coming period.

2. We have the following significant information about Firm A:

	1956	1957
Current Assets	3,500,000	3,250,000
Current Liabilities	1,800,000	800,000
Fixed Liabilities at 4%	200,000	1,400,000
Net Worth (40,000's)	4,000,000	4,300,000
Sales	17,000,000	17,300,000
Profit after taxes	600000	593,000

Explain what has happened to the financial position of this firm. Very importantly, what changes were made in its "current" capital position? Has the firm's general financial position improved? Use figures. Discuss.

Chapter 7

CAPITAL AND NEW ISSUE MARKETS

The essential advantage of the corporation over other forms of business organization lies in its ability to bring together large amounts of capital. This is especially true of those corporations, which are *publicly held* or *widely held*.[1] The small *family-held*, *closely held*, or *closed* corporation has basically the same financial sources as other business forms, i.e. trade credit, the banks, and the resources of family and friends willing to invest in the business. A widely held corporation, although it will also finance through trade creditors and banks, has the additional ability to tap the flow of investment funds available in the security markets, the market for stocks and bonds. The security market, alternately called the investment, financial, or capital market, comprises the group of institutions through which old corporate securities are traded and new issues of securities are floated. These markets have provided a significant part of the capital that has nourished the growth of corporate enterprise. Thus, to understand the birth of new corporations and the growth of established firms, it is necessary to understand the functions of the security markets.

The capital market is divided by function into two aspects; the secondary or old issues market, and the primary or new issues market. The secondary market makes it convenient for an owner of securities – stocks or bonds – to sell them to someone else. The primary market is concerned with floating new issues, with raising funds for existing corporate expansion or the promotion and creation of new publicly held firms.

1. THE SECONDARY MARKETS

The secondary markets consist of the organized stock exchanges – the so-called listed exchanges – and the group of security dealers and traders composing the over-the-counter market organized as the National Association of Security Dealers Automated Quotation (i.e. NASDAQ). In the United States the organized exchanges include the famous New York Stock Exchange, the much smaller American Stock Exchange (AMEX, also in New York City) and the various smaller regional exchanges. In December 2002, some 2783 companies with a market capitalization of \$9603.3 billion were listed on the NYSE. The NYSE domestic companies met the following criteria for listing[2]:

1. Total number of shareholders of 2200 or 2000 round-lot holders;
2. 1,100,000 shares of stock outstanding;
3. Market value of public companies of at least $100,000,000;
4. An affiliated company standard in which the stockholders (1) requirement is met and market capitalization of entity exceeds $500,000,000.
5. Aggregate pre-tax earnings over last three fiscal years of $6,500,000 as:
    a. Most recent fiscal years pre-tax earnings of $2,500,000 and previous two fiscal years pre-tax earnings of $2,000,000 (each); or
    b. Aggregate last three fiscal years operating cash flow of $25,000,000, if global market value exceeds $500,000,000 and revenues exceed $100,000,000 in last 12 months; or
    c. Average global market capitalization exceeds $1,000,000,000 and last fiscal years revenues exceed $100,000,000.

In December 2002, some 796 companies were traded on the American Stock Exchange. The number of companies listed for trading on the regional exchanges is considerably less. Listed companies are considered to have an active following or market. However, the securities of any company which develops a "following" may be traded at some time or other. Thus the over-the-counter market may deal sporadically with the securities of more than seventy thousand companies. The shares of most major well-known companies are listed on the New York Stock Exchange but some prominent newer companies are traded on the NASDAQ which has grown enormously in recent years including such notable firms as Microsoft and Apple Computers. The relative out-performance of the NASDAQ during the 1985-2000 period, gave rise to its new Tower at Times square and coverage on finance news. The world's largest electronic exchange lists over 3600 companies and its informal over-the-counter market handles the largest volume of transactions in both government and corporation bonds.

The organized stock exchanges are strictly secondary markets: they do not float or sell any new issues. The over-the-counter market straddles both functions; the firms on it handle the trading of previously issued securities and also take part in the sales effort on new issues. The function of the organized exchanges and the NASDAQ should not be misunderstood. The monies invested for the purchase of existing stocks do not go to the underlying company. They pass from the individual buyers to the individual sellers. The stock exchange does not set the price of securities. The "market," an abstraction for the freely competing buyers and sellers bidding for and offering various securities, sets the price on each individual security.

A letter published in the *Wall Street Journal* some years ago defines the contribution of the secondary market to the economy.

> A stock exchange is a second-hand market; that is, it enables those who have "old" securities to sell them to others. Such change of ownership obviously has no effect on the amount of capital assembled by the company whose securities are traded. The great economic significance of the stock exchanges in this context is that if such a splendidly functioning second-hand market were not available for disposing of securities once purchased, there would be a greater difficulty than there is in selling new issues and, thus, in accumulating large aggregates of capital.[3]

The secondary market furnishes the desirable quality of liquidity or marketability to investments in the stocks and bonds of traded corporations. The market will accept a somewhat lower rate of return on liquid or marketable investments over those that have no market. The cost of capital is lower for corporations that are established on the secondary markets. Equivalently we can say that the issuing corporation can acquire funds at a lower cost if its securities have access to the secondary market.

The secondary market provides some other useful function in a modern economy. By setting the levels of prices on already issued securities, it indicates the yields, interest rates, and price earnings levels that must be placed on new securities to float them successfully on the primary markets. Thus the secondary market acts as an indicator or measuring gauge for the costs of new capital funds. It also helps to ration capital. Since a relatively higher price is set on the securities of industries whose prospects seem promising and a lower price placed on the securities of industries whose future seems less bright, the secondary markets help direct the flow of capital funds toward the more favored areas of the economy.[4]

The secondary market facilitates the mobility of funds. It harnesses the resources of investors who have somewhat more aversion to risk in support of the primary market. This occurs because some of the overflow of funds out of the secondary market helps to furnish money for the new issue (primary) market.[5] An idealized schematic explanation of this statement would take three steps:

1. Primary market. The venturesome investor puts his funds into a new enterprise.
2. The over-the-counter market (part of the secondary market). The new company having become fairly well established, our risk-taking investor sells its securities. He takes the funds released by the sale and searches for another new venture.
3. The organized exchange. After some seasoning on the over-the-counter market, the firm's securities are listed on an organized exchange. The securities are gradually taken by relatively more conservative investors. The funds from these sales are placed in the securities of newer and smaller companies traded over-the-counter. As the securities are passed up the ladder to somewhat more conservative investors, funds filter down to the new issue market. The secondary market enables the providers of true risk capital to withdraw their funds from successful ventures and seek out new enterprises.

The secondary market performs its functions well when it is in a more or less "normal" range. When the market is in a speculative fever or seized in a wave of excessive pessimism, its malfunctioning probably adds an extra disequilibrating factor to the aggregate problem.

1.1 The Primary Market

The primary market is the complex of investment bankers, over-the-counter houses, and security dealers who combine to sell new issues to individual investors and institutions.

Although it is smaller in dollar volume than the trading markets, the primary market from an aggregate economic view is more important. On the secondary market, if one investor sells his securities to another, no new funds necessarily enter the economy, no new business assets appear, the underlying company does not grow nor does the productive capacity of the economy increase. But when a new issue is sold on the primary market, the company making the sale raises new funds from the investors. These funds may be used to payoff old debt, but more likely they will be used to acquire new assets: new inventory, plant, or equipment. So used, these funds re-enter the income stream, increasing the gross national product. Moreover, these new assets constitute real capital formation, increasing the productive capacity of the firm and the economy. The primary market is a part of the machinery through which aggregate savings are tapped to create net new investment and economic growth. If the savings of the economy do not re-enter the income stream at the proper rate, the rate of economic growth will be retarded.

2. INVESTMENT BANKING AND NEW ISSUES DEPARTMENT

The investment banking firms and the new issues department of the brokerage firms are an integral part of the primary market. The new issues firms help devise the legal content of the new issue, agree on the interest rate or price that can be set on the securities, and then takeover the sale of the issue on the market. (The investment firm that finds the issue and guides it through the primary market is called the originating house.) When a security firm floats an issue of securities on a firm commitment or underwriting basis, it purchases the whole issue directly from the corporation before it is placed for sale on the market. US firms have moved from using rights issues to using the firm commitment method of selling seasoned public offerings (SPOs) during the 1950-2003 period, and 60% of IPOs are sold using the firm commitment method [Eckbo and Masulis (1995)]. The funds to enable the investment bankers to carry the securities (their inventory) until they are sold are generally obtained from the commercial bankers. The price the new issue firms pay to the issuing corporation is somewhat less than the buying price set for the market. This difference, the charge, or "spread," compensates the security firms for their advice, their selling services, and for the risks they assume.

There are some 8 to 10 investment firms who handle most of the originating and underwriting business. Such firms as Goldman Sachs, Merrill Lynch, and Morgan Stanley, are among the largest underwriters. Although these firms are rivals, they will cooperate and form groups or syndicates of various sizes to float large issues. Many possible combinations of bankers and dealers and organizational structures can be used in floating an issue of securities; there are, however, three recognizable functions performed for most security issues: originating, underwriting, and selling. (On a small issue, one or all of these functions may be combined.)

2.1 The Originating House

The originating house advises the issuing firm on the features, terms, and prices of the security to be floated. It sets the spread it will take for floating the issue. It undertakes to get together the underwriting group. The spread is divided among the underwriters and sellers. In addition to a relatively small fee for being the sponsor of the whole issue, the originating house obtains its pro rata share of the spread, usually a major allotment, for its participation in the underwriting. (The largest share of the spread usually goes to the selling group since they generally put in the most effort and time.) The originating house also receives its proportion of the spread on the amount of the securities that they hold out to sell themselves. Thus the competition to originate issues rests on the advantages in functioning and obtaining returns on three levels, originating, underwriting, and selling.

2.2 The Underwriting Group

The underwriting group, of which the originating house is a part, agrees to purchase the total issue at a fixed price. Each house assumes a part of the issue. The members of the underwriting group are on a firm commitment basis. Thus they may take a loss if the issue moves slowly or if the price at which the market will take the securities drops below the spread; in short, they risk a loss if they are not able to sell all of their quota at the price agreed upon with the issuing corporation.

2.3 The Selling Group

The selling group is composed of the underwriters plus other firms invited to help sell the issue. Usually a concerted drive is made to sell the issue (close the books) as quickly as possible since the risk to the underwriters increases as the selling period lengthens. Generally, the selling group is on a "best effort" basis. This means they get a commission on what they sell; they are not, however, forced to buy the unsold part of their quota, but may return it to the underwriters. Of course, a firm in the selling group that fails to place its quota too often is likely to find itself uninvited to participate on later floatations.

3. OTHER ASPECTS OF INVESTMENT BANKING

3.1 Best Effort vs. Firm Commitment or Underwriting Basis

Sometimes the securities of a new, lesser-known, or weaker firm are floated on a "best effort" basis. The investment banker has no commitment to purchase the issue at a fixed price. He does his best to sell the issue, and he gets a commission on all he sells. In contrast to the underwriting agreement, the investment bankers take no risk of loss since they may return any unsold securities to the issuing corporation.

3.2 Initial Public Offerings (IPOs)

An interesting aspect of investment banking is the market for IPO.s, the initial public offering of the shares of new companies. In the 1990s, the floatation of IPOs in the "Hi-Tech" industries was a source of considerable income for the investment banking firms. IPOs have been sold on a firm commitment or underwriting basis rather than floated on a "best effort" basis during the 1980-2003 period. The investment bankers gave no commitment to purchase the issue at an agreed upon fixed price.

Profits to the security firms on a successful IPO could be quite large. The spread between the market offering price and the return to the issuing companies could be as high as 20%. [Ibbotson and Jaffee (1975), Ritter (1984), and Chen and Ritter (2000)]. In the boom period for new issues, it has been apparently common practice for the IPO shares to be underpriced. There is a pronounced under-pricing differential between IPOs with an offering price below \$3.00 and those with an offering price exceeding \$3.00. Ibbotson, Sindelar and Ritter (1994) report that IPOs with offering prices less than \$3.00 produced returns of 42.8 % for the 1975-1984 period; whereas the corresponding IPOs with offering prices exceeding \$3.00 produced an average return of 8.6%. In the trading hours shortly after the issue was placed on the market, the market price might rise 50% to 100% over the original offer price. It seemed that the managers of the corporation were not opposed to these phenomena. Although the funds going directly to the corporation were somewhat less than they might be, the pro-forma wealth in their own holdings of shares rose with the market. In the three years following IPOs during the 1975-1984 period, Ritter (1991) found that IPOs substantially under-performed matched firms on an risk-adjusted basis. (A profitable investor should only be a short-term holder in IPOs.) A recent study of more than 1100 IPOs, raising between the $20 million -$80, launched during the 1995-1998 period found that 90 percent of the issuers paid gross spreads o underwriting discounts of exactly seven percent [Chen and Ritter(2000)]. The IPO gross spreads in many developed nations were approximately one-half the US spreads, calling into question the competitiveness of the US IPO market. The largest five investment banks underwrote 60% of the deals during the 1999-2000 period, and the largest 15 banks accounted for 95% of the deals {Fang (2005)]. Fang found evidence that the larger, more reputable banks had more stringent underwriting standards, particularly for junk bonds, and produced higher net proceeds for their clients, despite charging higher fees.

New corporations start out by selling common shares. A corporation is formed by stockholders, the owners of the firm. Most corporations are relatively small, are held privately, and remain so throughout their economic life. However, an interesting juncture in a firm's life is when a decision is made to "go public." The firm engages in an initial public offering (IPO). It sells shares on the market to outside stockholders. In the promotion of a new venture, the inside shareholders may decide on an IPO to finance the enterprise. They find an investment banker willing to form a syndicate to float shares to the general public. A new public issue requires a published prospectus presenting a detailed study of the proposed new business, which must obtain the approval of the SEC. The prospectus contains estimates of potential revenues, etc. and projects the necessary initial investment. The prospectus must specifically acknowledge that all details are estimates and that the whole proposal is subject to risk. Of course, a completely new enterprise has no past record of revenues and profits.

4. EXPANSION OF A PRIVATELY HELD FIRM INTO A PUBLIC CORPORATION

A new business generally starts out as a proprietorship or a partnership. If it does take the corporate form, the initial investors are usually a group of relatives, associates, or friends. Such a new corporation is classified as closely or family held. If the firm has growth or expansion plans, it may invite the public to participate in the firm by selling shares through a flotation of stock on the market.[6] If the publicly held shares exceed that of the internal group, it is now a publicly held company.

The flotation of new stock may secure equity capital in a larger amount and at a more rapid rate than the retained earnings of the firm or the private resources of the initial owners can or are willing to supply. If capital is required to take advantage of a profitable opportunity to expand, a sale of new common stock not only supplies new equity funds, but by buttressing the equity base, it enables the firm to borrow additional debt on better terms. Alternatively, a firm that has financed past expansion with debt capital might wish to float a stock issue to secure additional risk bearing equity capital in order to place its financial affairs on a firmer footing.

The owners of a firm may go to the market with a capital stock flotation for reasons other than that raising of additional funds. Having some part of the stock traded on the market establishes a going price. This makes it easier to adjust the ownership value of different individual owners and to settle estates. The original owners may no longer be interested in the direct management of the company or in having so much invested in one company. A public flotation of new stock brings outside funds and participation into the company. By allowing a market to develop for the company's shares, the original holders can dispose of some of their present shares and diversify their holdings. A company with shares on the market can also make more appealing offers in the way of stock option or stock bonus plans to attract managerial talent. In the initial flotation of a closely held company, shares are often sold both for the company and for the account of the original owners. This serves the dual purpose of increasing the corporation's equity base and decreasing the participation of the original shareholders.

Floating the stock of a privately held company that wishes to go public is not as difficult as selling the stock of an entirely new venture. The SEC prospectus can show a record of past earnings and perhaps even dividends on which to base the market price of the shares. Potential investors can compare the firm's past performance and growth possibilities with that of similar companies. The price for the new issue-based on such criteria as price earnings ratios, dividend yields, financial structure, earnings growth per share, and asset structure – can be set competitively with other stocks already on the market.

5. THE PROBLEM OF CONTROL

A firm contemplating a market flotation may consider the problem of control. Fear of losing the advantages of controlling the management of the company has prevented some firms from selling stock to the public even though from a purely financial point of view it would be profitable to both the original and the new shareholders. On the other hand if the original ownership group has lost interest in the direct management of the firm, the problem arises of how to obtain and maintain loyal and competent management. In normal times, there is a shortage of good managerial and executive talent, rather than the reverse.

Going public creates marketable shares which can be used to help solve the agency-principal problem where the principals, the owners (stockholders) of the firm, need to set up a reward or compensation structure which will induce the managers (the agents) to operate as fully as possible in the owner's interests. (In simpler times, the problem was resolved by offering the manager the owner's daughter and/or a share in the business.) In the corporate world, part of the agent's compensation can be in the form of grants of shares or stock options. Presumably if the managers hold shares, they will operate to maximize the share value, thus increasing their own wealth and that of the rest of the stockholders. In actuality, the solution has not always worked that well, especially in cases where the holding period for the managerial shares was very short and the agents operated to push up the short run price of the stock at the cost of the long run health of the company and a poor outcome for the longer term holders of the stock.

If there is a strong desire to maintain control, the holding group may issue only a minority of the common stock. (The company is then classed as closely or family controlled rather than closed or family held.) Close control, however, often breaks down as with the passage of time as the ties among the original founding group become tenuous. At this point, a strong outside interest may link up with some faction or descendants of the original holders and acquire control.

6. PROMOTION OF A SUBSIDIARY BY PARENT CORPORATIONS

A firm venturing into a new field that differs from its main line of business may find it strategic to do so by forming a subsidiary. The parent company lends organizational and managerial talent to the new company and helps in the financing, both with credit and by purchasing all or a significant part of the new company's shares. If the parent company owns all of the subsidiary company's common stock, the subsidiary is called 100-per-cent owned or wholly owned. Alternatively some of the subsidiary's shares may be floated on the market and the firm organized with some public participation.[7]

Why should a company go through the trouble of promoting a subsidiary rather than simply creating a division of the main firm? The reasons are legal, organizational, and financial. From the legal point of view, the subsidiary may be able to obtain a broader charter, or operate in a different jurisdiction or country than the parent company. From the organizational point of view, the subsidiary allows for decentralization of administration. The parent company can endow the management of the subsidiary with some independent responsibility for the economic success of the new venture. Moreover by organizing a separate subsidiary, the firm is able to limit its financial responsibility in the new venture. If all goes well, the parent firm benefits almost as much from the subsidiary's prosperity as if it were a division or branch. In the event of losses or operating difficulties, the parent company can minimize its losses by cutting the subsidiary loose. At worst, the parent company is not likely to lose more than its original investment unless it has endorsed all or part of the subsidiary's debt.

When the parent company organizes a subsidiary with "public participation," it purchases or acquires a large part of the new subsidiary's stock, while the rest of the shares are sold to the public. This limits the investment-at-risk of the parent company, but still gives the new subsidiary an adequate equity base. Moreover, if the new company starts out with some public ownership of its stock, its shares will develop investor acceptance, and it will be easier to float new stock to finance future expansion plans. A political advantage in having public participation lies in reducing the onus for demonstrating "monopolistic expansion tendencies." If the subsidiary is located in a foreign country, it is often useful to have a group of native stockholders interested in the success of the venture.

The subsidiary as a new legal entity or firm might be considered a new venture. However, it is easier for a subsidiary to carry out a successful public flotation of its stock than it would be for an entirely new company. A firm partly financed by a parent company possesses considerable advantages; probably it has a seasoned management, and its assets are likely to be in working order from the beginning. In short, the parent company may bestow considerable operating and credit facilities on its offspring.

7. FORMATION OF A JOINT SUBSIDIARY BY TWO OR MORE PARENT COMPANIES

Sometimes two or more parent companies form a new venture because the new area of operation falls somewhere between the usual operations of both companies. Each company limits its overall financial participation in the new company, but each may contribute technical or economic know-how in the area it knows best.

Of special interest is the formation of joint ventures linking firms in different countries. Using one country's firm's processes or products, the other country's firm may furnish local manufacturing facilities and/or knowledge of local markets. For example, if a foreign firm locates a joint subsidiary in the United States, the American parent may furnish the production facilities or knowledge of distribution channels while the foreign parent brings a new patent, products, or processes.

Of course, any of these joint subsidiaries may involve public participation. If the subsidiary is successful and grows, sometimes one or both of the parent companies may divest itself of its holdings either by selling its shares in the market or by "spinning them off," i.e., giving its holdings in the subsidiary to its own shareholders. This may be done if there is an antitrust problem or if the combined management becomes too unwieldy. In a sense the parent corporation performs the role of the "classical promoter." Another possibility is an eventual reshuffling of interests between the parent companies so that one buys out the interest of the other and makes the offspring into a wholly owned subsidiary.

8. THE SEC AND THE FLOTATION OF NEW ISSUES

From 1932 to 1934 the Senate Committee on Banking and Currency, whose chief counsel was Ferdinand Pecora, held a series of investigations on the operations of the securities business in the 1920's. These hearings disclosed considerable evidence that many areas of the security market operations fell short of normal notions of honesty and that in the promotion of many stock and bond issues there had been a considerable disregard of the interests of the investors. No doubt the reaction to the hearings were partially colored by the attitudes of the Depression decade to the prodigal and profligate twenties; nevertheless, the legislation that resulted was well considered and constructive. More recently, the market plunge of 2002 brought about a demand and rules for increased surveillance.

The provisions of the Securities Act of 1933 as amended require the pre-registration of all public issues over a set dollar amount that are not the obligations of the federal, state, or local governments or their instrumentalities.[8] A registration statement containing exhaustive details on the new issue-reports by accountants and engineers, a description of the company's properties and business, a description of the securities offered for sale, past or projected earnings, liabilities incurred and assets acquired, the names of the promoters and their interest in the firm, the names of the officers, and the names and addresses of the major stockholders-must be filed with the SEC. The registration statement approximates the size of a "small telephone book." The SEC puts in a "stop order," holding up the issue, if any item on the registration statement appears questionable. If the corporation fails to amend the statement, the commission may refuse to grant permission to float the issue. Nevertheless, the commission does not vouch for the accuracy of every item in the registration statement, and the law specifically forbids issues to state or imply that the SEC has approved the issue. Since the registration statement is very lengthy, the issuing corporation draws up a prospectus, a booklet of about ten to twenty pages summarizing the most pertinent data in the registration statement. The prospectus, which must be given to all prospective purchasers, is full of information useful to a thoughtful investor. The Securities Act of 1933 prohibited deceit, misrepresentations, and other fraud in the sale of securities, but could not guarantee the information provided was accurate.

Although fines and imprisonment may be enforced against violators of the commission's orders, the heart of the enforcement of the Securities Act lies in the potential individual liability which exists against the (1) corporation, (2) its chief officers, (3) all of its directors, and major stockholders (who may control directors), (4) underwriters and sellers, and (5) all experts whose statements are included, for any omission of material fact or misstatement appearing on either the prospectus or registration statement. Any purchaser of the issue may bring civil suit for damages against any or all of these groups if he suffers a loss and an inaccurate statement appears on the prospectus or registration statement.

The registration statement has been criticized for its length and cost, since very few investors need (or indeed are willing) to study and evaluate any more information than that presented in the prospectus. The statement is put on file, however, and prospective investors may request photostatic copies. The institutional investors (banks, insurance companies, etc.), who constitute the backbone of the bond market, make good use of the details on the registration statement, and perhaps the mutual funds, the managers of pension funds, the brokerage houses, and very large and sophisticated individual investors may find it valuable to study the quantity of data available in the registration statement. Because these groups constitute a sort of leadership among investors, the results of their evaluations can affect the acceptance of the issue by the capital markets. Of course if they behave badly, the result may be a speculative bubble which could upset the normal operations of the market for a considerable time.

Risky, foolish, or ill-conceived companies may still legally sell their securities so long as they reveal the truth in their registration statement and prospectus. (A prospectus, for example, may reveal that an overwhelming proportion of the company's stock is going to the organizers for assets of nebulous value, whereas the outside investors are expected to furnish all the cash and shoulder almost all the risk for a minority share of the prospective gains. Nevertheless, all the facts are revealed, and the issue is perfectly legal.) The Securities Act of 1933 as amended has been called the "Truth in Securities Act."

The reforms brought about by the Securities Act and the power granted to the SEC has entailed some economic costs. The expenses of drawing up the registration statement and prospectus may weigh heavily on the issues of small companies. The fear of the many-sided penalties may preclude the promotion of some risky but justifiable ventures. Nevertheless the greater the reliance investors can repose in the facts offered in the new issue market increases their willingness to risk their capital. Investor confidence is an important part of the dynamic of a relatively free enterprise system. Without it, a large source of risk capital dries up, and the formation of new enterprise increases in productive capacity, and economic growth can slow to a deleterious level.

8.1 Secondary Floatations

Investment bankers on occasion underwrite the sale of a large block of securities for an estate, a large individual owner, or an endowed institution. These secondary flotations or secondary offerings differ from a regular primary issue in that the proceeds of the sale do not go to the corporation but to the original holders of the securities. Selling a large block of securities through the regular market channels might depress the price; moreover, if the securities are sold slowly over time, the sellers assume the risk of changes in the market price in the interim. Often, then, the underwriting function, the marketing facilities, and the skills of the investment bankers are used to sell the securities at a determined price at an immediate time.

8.2 Issuing Securities through Rights

Unless the shareholders waive their rights, an established corporation must allow its common stockholder a privileged subscription position on new common stock issues. When a company issues new stock under the conditions of privileged subscription or pre-emptive rights, the present common shareholders are given the first opportunity to buy the new shares in proportion to their present holdings.[9] If an issue of new stock is made through privileged subscription, the new shares are usually priced under the going market price. The privilege of buying the new shares at this bargain price attaches to each outstanding share. It is represented by a negotiable "right" which can be either exercised or sold before the subscription date to be used by someone else to purchase the new shares. The intrinsic value of a right on the market can be obtained through the use of a simple formula, namely:

$$\text{VR} = \frac{\text{MPOS} - \text{PSP}}{\text{N} + 1}$$

where VR is the value of the right, MPOS is the market price of the existing shares, PSP is the privileged subscription price and N is the number of old shares required to buy one new share.

For example, suppose a firm with 6,000,000 outstanding shares, floats a new issue of 600,000 shares giving pre-emptive rights to the existing stockholders. The going price of the stock on the market is \$36.60, and the subscription price is \$30.00.

$$\text{Value of a Right} = \frac{\$36.60 - \$30.00}{10 + 1} = \frac{\$6.60}{11} = \$0.60$$

The intrinsic value of a right is \$0.60, and it requires ten of these rights plus \$30 to buy a new share. If a shareholder sells a right he will get \$0.60 for it, representing a compensation for the dilution of his equity, and the market price of his stock drops to \$30.00, since the stock is now quoted *ex-rights*. Conversely, a prospective new shareholder can buy ten rights (10 X \$0.60) and use them to buy a new share, which, including the payment for the rights, costs him \$36.00 (\$0.60 less than the present price); however, the new share is also ex-rights. If the original holder exercises his rights himself, he acquires one new share at $30 for every ten old shares, valued at $36.60, he presently holds. The average value of the eleven shares works out exactly to $36.00. Because the value of a right is considered a return of capital, the stockholder who sells his rights need not pay personal income tax on the proceeds; however, the sale is used to reduce his original acquisition costs so that if he later sells his securities at a profit, his taxable capital gains will be that much larger.

Because the market value of rights moves up or down proportionately more than the value of the underlying shares, generally rights tend to sell at a slight premium. Since they have a more volatile price movement, they give the speculator a "greater kick" for his investment, and there are those who will pay for the privilege of gambling.

Although a company could manage to sell a new issue of stock by itself by pricing the new shares below the market and using rights, most firms prefer to enlist the aid of an investment banker to insure the success of the issue. The investment banker makes a "standby pledge" by which he is obligated to purchase all shares not subscribed to by the rights holders. The period between the issue of the rights and the subscription deadline may be as long as thirty days. It is possible in this time for the market price of the stock to drop below its subscription price; the banker would then suffer a loss under his standby commitment. Ordinarily, however, since the new issue has been floated below market, all rights (except those of some few stockholders who may not be fully informed or wait too long or are negligent) are exercised. Under these circumstances picking up the few neglected rights furnishes an additional source of income to the investment bankers. In addition to the standby agreement, the underwriting banker on a privileged subscription usually administers and records the exercise of the rights and the accounting for the new shares.

8.3 Stock Tenders

Technically, a tender is a pledge of the willingness of a holder to sell his securities in response to an open bid by a corporation or an individual to buy outstanding securities at a designated price. In financial language, however, the whole transaction – bid and response – is likely to be called a tender. Sometimes a firm may bid for bond tenders when it wishes to pick up bonds for retirement. The stock tender, however, is probably more common and certainly more interesting.

Stock tenders may be thought of as a reverse flotation. On the completion of a successful tender request, shares formerly held in the market are concentrated with one holder or retired. A bid for tenders may be used for the following purposes:

1. By a corporation to retire some of its own shares
2. By one group of shareholders to buyout dissident shareholders
3. By a corporation to acquire another corporation
4. By a corporation to extend its holdings in a subsidiary, possibly with the view of acquiring enough shares to enable it to consolidate its income statement for tax purposes
5. By an individual or group of individuals to acquire enough shares to obtain control of a corporation.

During the past 30 years, most tender offers have been merger-related.

The group making the offer to buy will designate a transfer agent – usually a large bank – to register the shares tendered for sale according to the terms of the offer. The price at which the stock will be purchased is fixed somewhat above the market price. Once the offer is made, however, the market price of the stock will not fall below the tender price as long as the tender is still open. A date is set for the termination of the tender. Most requests for tenders run about two weeks to a month. A tender offer may be open, in which case all stock tendered before the termination date will be purchased. The terms may, however, set an upper limit; e.g., only the first 100,000 shares submitted will be picked up. When a definite number of shares is required for the purchasing group's purpose, there may be an all or nothing tender. The terms will state, for example, that a minimum of 100,000 shares must be submitted or none of the shares will be bought. An all or nothing tender offer can be combined, of course, with an upper limit. The tender price can be stated in cash, in an exchange of securities, or in a combination of both.

The purposes of a request for tenders could be accomplished by purchasing the desired shares on the open market. By using the tender device, however, the price paid per share can be limited. Perhaps some of these shares could have been bought for less on the open market, but the purchasing activity in the shares might raise their price so that the average cost of the shares becomes greater than they would be if purchased by tender.

One interesting use of a request for the submission of tenders is the retirement of some of its outstanding common shares by the corporation itself. Such a tender is akin to a partial liquidation and might be employed if the corporation has redundant liquid funds which are not contributing much to its earnings. The tender accomplishes a reduction in the firm's ownership capital with a subsequent increase in the earnings of the remaining shares. Perhaps a partial liquidating dividend would be the fairer way to accomplish the same purpose. However, the buyback or tender limits the personal tax to the capital gains rate.

9. COSTS OF FLOATING AN ISSUE

The major cost of a security is its servicing charge – the amount of interest or the earnings yield the firm must make over time to entice the market to buy the issue. The actual costs of floating the issue – the legal expenses, fees, and the spread of the investment banker – is usually a relatively minor consideration and only rarely affects the type or timing of the issue.

In general, the costs of flotation depend on the expected risks and difficulties of selling the securities. This is affected by the type of underwriting agreement, the class of security, the size of the issue, and the security market seasoning and reputation of the issuing company. Equity floatation costs are considerably greater than debt floatation costs. Straight debt costs less to issue than convertible debt, see Table 1.

1. Issues of greater price stability cost less to float than issues, which are by nature, somewhat more volatile. Debt securities (bonds and debentures) are relatively inexpensive to float compared to stocks, and preferred stocks are floated for a cheaper percentage than common shares.

2. Issues of seasoned, well-known companies can be floated for a relatively lower spread than those of new or more speculative companies.

3. An issue of common shares through the use of rights and a standby arrangement with the investment bankers will cost less than an underwritten flotation price with rights waived.

4. Since the bankers incur certain costs, such as advertising, which do not vary proportionately with the size of the issue, larger issues are generally handled at lower percentage underwriting and selling fees than smaller issues of the same quality.

5. The split between the selling fees, underwriting fees, and the originating house or managing house charges depends on the expected risks and difficulties in selling the issue. Although the underwriters take the risks, the sellers may have to incur more expenses. Their share of the spread must be large enough to encourage them to sell the issue.

Table 1. Direct Costs as a Percentage of Gross Proceeds for Equity (IPOs and SEOs) and Straight and Convertible Bonds Offered by Domestic Operating Companies, 1990-1994

	Equity						Bonds					
	IPOs			SEOs			Convertible Bonds			Straight Bonds		
Proceeds (millions of dollars)	GS[a]	E[b]	TDC[c]	GS	E	TDC	GS	E	TDC	GS	E	TDC
$ 2-9.99	9.05%	7.91%	16.96%	7.72%	5.56%	13.28%	6.07%	2.68%	8.75%	2.07%	2.32%	4.39%
10-19.99	7.24	4.39	11.63	6.23	2.49	8.72	5.48	3.18	8.66	1.36	1.40	2.76
20-39.99	7.01	2.69	9.70	5.60	1.33	6.93	4.16	1.95	6.11	1.54	0.88	2.42
40-59.99	6.96	1.76	8.72	5.05	0.82	5.87	3.26	1.04	4.30	0.72	0.60	1.32
60-79.99	6.74	1.46	8.20	4.57	0.61	5.18	2.64	0.59	3.23	1.76	0.58	2.34
80-99.99	6.47	1.44	7.91	4.25	0.48	4.73	2.43	0.61	3.04	1.55	0.61	2.16
100-199.99	6.03	1.03	7.06	3.85	0.37	4.22	2.34	0.43	2.76	1.77	0.54	2.31
200-499.99	5.67	0.86	6.53	3.26	0.21	3.47	1.99	0.19	2.18	1.79	0.40	2.19
500 and up	5.21	0.51	5.72	3.03	0.12	3.15	2.00	0.09	2.09	1.39	0.25	1.64
Average	7.31%	3.69%	11.00%	5.44%	1.67%	7.11%	2.92%	0.87%	3.79%	1.62%	0.62%	2.24

Note:
[a]GS – gross spreads as a percentage of total proceeds, including management fee, underwriting fee, and selling concession.
[b]E – other direct expenses as a percentage of total proceeds, including management fee, underwriting fee, and selling concession.
[c]TDC – total direct costs as a percentage of total proceeds (total direct costs are the sum of gross spreads and other direct expenses).

Source: reprinted with permission from the *Journal of Financial Research*, Vol. 19, No. 1 (Spring 1996), pp. 59-74, "The Costs of Raising Capital," by Inmoo Lee, Scott Lochhead, Jay Ritter, and Quanshui Zhao.

10. REGULATION OF THE CAPITAL MARKETS

Under the New Deal administration of the 1930's, Congress passed a number of laws designed to eliminate questionable practices and to enforce a higher level of business morality in the investment markets. Over time as conditions developed additional acts and regulations have been added to the mix.

10.1 Securities Act of 1933

As previously discussed, the Securities Act of 1933, mandates new issues to file full information, registration statements and prospectuses, with the SEC, as was stated earlier in this chapter. The SEC is composed of five commissioners, appointed by the President, confirmed by the Senate, and whose term is five years. No more than three commissioners can belong to the same political party, reducing potential partisanship. The President designates one of the Commissioners as Chairman, the top executive in the SEC. President Franklin D. Roosevelt appointed Mr. Joseph P. Kennedy as the first SEC Chairman. The current chairman is Mr. William Donaldson, and Cynthia Glassman, Harvey Goldschmid, Paul Atkins, and Roel Campos. The Commissioners interpret Federal Securities laws, amend existing rules, propose new rules in response to changing market conditions, and enforce rules and laws. The SEC is composed of four divisions: (1) Corporate Finance, which reviews registration statement's for newly-offered securities as well as 10-K (annual) and 10-Q (quarterly) filings, annual reports and proxies, and merger and acquisition filings; (2) Market Regulation, which establishes and maintains standard for fair, orderly, and efficient markets, including monitoring the financial integrity program for broker-dealers, reviewing self-regulatory organizations (SROs), and surveilling markets; (3) Investment Management, overseeing and regulating the $15 trillion investment management industry, including mutual funds and investment advisors; and (4) Enforcement, which investigates possible violations of security laws. Enforcement obtains evidence of possible violations. The most common SEC investigations include insider trading, misrepresentation of information about securities, manipulating market prices of securities, sale of securities without proper registration, and stealing customer's funds or securities. The Act, had the objective of enforcing full and truthful disclosure of all pertinent facts to prospective investors on the primary market.

10.2 The Securities Exchange Act of 1934

The Securities Act of 1933 was followed by the Securities Exchange Act of 1934, which established the Securities Exchange Commission, the SEC. The SEC was empowered to register, regulate, and oversee brokerage firms, transfer agents, clearing agencies, as well as the self regulatory organizations (SROs), which include the NYSE and AMEX. The Securities Exchange Act of 1934 required annual (and other periodic) reports of firms with assets exceeding $10 MM, and more than 500 owners. The Securities Exchange Act governs proxy solicitations, tender offers involving direct purchase or a tender offer of more than 5 percent of a company's securities. Fraudulent insider trading was prohibited by the Securities Exchange Act of 1934. The existence of the SEC has not prevented all losses on questionable securities. Unscrupulous promoters and security salesmen may still take advantage of investors simply by risking the fines, prison terms, and civil suits which false statements may entail. The SEC does not guarantee the profitability of any venture. An investor making a bad choice will lose money on his purchase of securities.

Trading on the exchange has been regulated in the following respects:

1. The Federal Reserve Board is given authority to set initial margin requirements (the amount required of the purchaser in cash as a percentage of the market price of stock), and to regulate the extension of credit on the market.[10] (Low margin requirements create a weak market. If the stocks start to drop, the brokers may strengthen the downtrend by selling the margined shares in order to protect their loans.)

2. Brokers' indebtedness to all persons may be regulated and such indebtedness may not exceed twenty times the net capital of the firm.

3. Brokers may not lend customers' securities without their consent. The lending of securities is used to effectuate a short sale. A short sale is made by someone who expects the price to go down. He borrows the stock and sells it at the going market price. When (or if) the price falls, he repurchases the stock (covers his sale) and returns it to the lender. The difference between the repurchase price and the price at which the shares were originally sold is the short sellers' profit.

4. The manipulation of stock prices by wash sales, excessive activity, and misleading statements is made unlawful.

5. Options (puts, calls, etc.) and short selling are regulated by the commission. Short sales can only be made on the "up-tick" – the stock must have moved up a fraction of a trading point since its last regular sale. (This rule handicaps a "bear raid," where a speculative group hammers

down the price of a stock by continuously offering more shares as it motes downward.) We discuss option pricing and strategies in Chapter 16.

6. The commission was authorized to supervise the activities of the "specialists," members of the exchange who act as a broker on certain transactions and in other instances "create a market" (act as dealers) on companies stocks assigned them by the exchange. The specialist is a critical part of the stock exchange's machinery; it is doubtful if a manipulative "pool" could be successful without enlisting the *sub rosa* aid of the specialist.

10.3 Banking Act (Glass Steagle Act) of 1933

One of the clauses of the Banking Act of 1933 was a requirement that deposit bankers divest themselves of investment banking affiliates. (Commercial banks were prohibited from floating or dealing in any securities except federal and state and local government obligations.) Many of the investment banking affiliates were organized as subsidiaries by the big city commercial banks in order to participate in the profitable security issue business of the 1920's. The history of these investment banking affiliates did not in the end reflect very favorably on the acumen a financial judgment of their organizers and management.[11]

The security affiliates of commercial banking firms represented a potential conflict of interest; they violated the general legal concept of the "arms-length transaction" which is enforced wherever fiduciary (or quasi-fiduciary) relationships are involved. Possible conflicts of interests between the commercial bank, its depositors, and its investment banking subsidiary could arise in the following instances:

1. If a depositor asked his banker for advice on investments, the banker might be tempted to recommend an issue being floated by the security affiliate. Indeed, the list of depositors of the commercial bank often served as a prime source of prospects for the affiliate's sales.

2. When the commercial bank bought securities for its portfolio, it might choose an inferior issue floated by the affiliate. (And the high quality of the bank's investment is one aspect of the safety of its deposits.)

3. If the bank felt that one of its borrowers was stretching out his repayment, they might have their affiliate float an issue for him, the proceeds to repay the loan. Here the commercial bank would get rid of a potentially embarrassing asset by shifting it to the outside investors. This is a subtle violation of the implicit investment banking code – that the

investment banker lends his name to the general soundness of the issue considering its description and class.

10.4 Glass Steagall Act Amended

In 1999 the Gram-Leach-Bliley Act (GLB) severely amended the original Glass Steagall Act. Large financial conglomerates, deregulated as financial holding companies (FHL) are allowed to have an investment banking subsidiaries as long as a “fire wall” exists between the activities of investment banking (new issues) and the regular banking or other activities of the conglomerate. The result has been a merger of all types of banks, stock brokerage firms, and insurance companies offering a department store of financial services. Each sector is supposed to be overseen by its own traditional functional regulator.

10.5 Retail Brokerage Houses

Of course the problems of conflicts of interest between different activities in the financial industry are endemic. A recent area of concern has developed in the brokerage industry where the brokerage firms also had large investment banking operations. Here a conflict of interest arises when the retail broker advises his clients to purchase a company’s new issues unwritten by his firm

10.6 Public Utility Act of 1935

The main purpose of this Act is breaking up and regulating holding companies in the gas and electric utility industries. In addition, however, the Public Utility Act of 1935 gave the Securities and Exchange Commission considerable powers over the financial affairs of the holding companies and operating subsidiaries.[12] The SEC must approve the terms and types of new utility issues and it sets broad bounds on permissible financial structures for the companies.

The SEC, in its authority under the 1935 Act, encouraged the use of competitive bidding in floating utility company securities. In 1941 it imposed a competitive bidding requirement on all public utility issues. (The ICC has required competitive bidding on the issue of railroad equipment trust certificates since 1926, and it imposed this requirement on all railroad securities in 1944. Municipal issues are almost always floated under competitive bids.)

Most corporation issues are still floated on a negotiated basis. The originating house advises the company on the features and terms of the issue, and negotiates the spread and fees. Under competitive bidding the issuing firm prepares all the terms of the issue except the coupon rate (stated interest rate) on bonds and the price. The investment bankers then submit bids citing the stated interest rate they will put on the issue, the price to the issuing firm, and the price to the market. The investment banker whose bid shows the lowest effective interest lost to the issuer (function of the rate and the price) wins the privilege of floating the issue and managing the underwriting syndicate. On a competitive bid issue, the firm performing the function corresponding to the originating house is called the managing firm.

Competitive bidding was pushed by some Midwestern investment bankers who felt that eastern bankers had established relationships with the corporations which gave them an unfair share of the new issue market, but their complaints found sympathetic ears at the government commissions. It was argued that the connections developed by the negotiated type of offering lead to investment banker domination of some firms. (The corporation became more interested in deals which furnished securities to be marketed than in company operations.) The most pertinent argument was that competitive bidding would lower flotation costs.

The old-line investment bankers originally opposed competitive bidding. They argued that it deprived the issuing firm of the private advice, market knowledge, and competent guidance of the investment banker in selecting the most advantageous type of security and setting up the best possible terms and provisions before the issue of the security. There may be some force to this argument when applied to industrial issues. However, the features of the issues commonly subject to competitive bidding – utilities, municipals, equipment trust certificates – are today actually quite uniform and standardized. There may not be any pressing need for the special expertise of the investment banker.

10.7 The Maloney Amendment, 1938

This amendment to the Securities Exchange Act gave the SEC some control over the secondary market activities of the over-the-counter dealers. (The primary market activities of these dealers falls under the general purview of the Securities Act of 1933.) The Maloney Amendment provides a system of self-regulation for the over-the-counter traders promulgated and administered by the National Association of Security Dealers. The Securities Exchange Commission passes on the rules, supervises their administration, and reviews the disciplinary decisions of the Association.

10.8 The Investment Company Act of 1940[13]

This Act largely unchanged to this day, provides for the federal registration of both the closed-end and open-end investment companies. (Open-end companies – mutual funds-stand ready to redeem their own shares at the pro rata underlying portfolio value. An investor in a closed-end company must sell his shares on the market.) Investment companies are financial intermediaries; they place the funds given to them by their own investors into securities of operating companies. People invest with them because they may provide better diversification and better portfolio management than the investor could achieve himself.

Although investment companies had a long history of successful operations dating from Scotland in the 1870's, they fell into disrepute in the United States in the 1930's. The Investment Company Act provided that companies who announced their investment policy clearly and adhered to it could register with the commission. Registration gave the company status in the eyes of the investor and removed some of the onus of the 1929 debacle. Among other things, a registered company must practice proper diversification of its portfolio, limit the issue of its prior claim securities and the use of margin trading, and renounce any holding company ambitions. If a registered company pays out 90 percent of its income and capital gains to its own shareholders, it need pay no federal income tax. The effects of the Investment Company Act must be considered salutary .The investment companies, especially the mutual funds, have experienced vigorous growth over the last sixty years and brought a healthy flow of savings into the capital markets.

10.9 Sarbannes-Oxley Act of 2002

President Bush signed the Sarbannes-Oxley Act of 2002, on July 30, 2002, which enhanced corporate responsibility and financial disclosure. The Act created a "Public Company Accounting Oversight Board" (PCAOB), to oversee activities the auditing process.[14] The SEC adopted requiring mutual fund CEOs and CFOs verification of stockholder reports, disclosure of codes of ethics, audit independence, and listing standards for audit committees. The audit independence ruing prohibited auditors from providing certain non-audit services related to conflict of interests standards. Exchanges and national security associations were prohibited from listing securities of any security not in compliance with certain audit committee requirements. Disclosure of the firm's adoption of a code of ethics was required, as was the presence of one "financial expert" serving on the audit committee.[15] Investment companies were encouraged by rule amendments to disclosure more balanced information to potential investors with respect to past performance. In December 204, the SEC established an advisory committee to examine the impact of the Sarbannes-Oxley Act on smaller public companies. The advisory committee, known as the Securities and Exchange Commission Advisory Committee on Smaller Public Companies, will concentrate on (1) the frameworks for internal control over financial reporting for smaller companies;(2) corporate disclosure and reporting requirements for smaller public firms, including differential requirements based on market capitalizations; and (3) accounting standards allpicable to smaller firms.[16] There could well be a cost to the public by the Sarbannes-Oxley Act. In 2002, some 67 firms delisted their common stock, whereas in 2003, 198 firms delisted common stock, or "went dark". The costs of compliance may be too high for many firms.[17]

11. THE CAPITAL MARKET AS A SOURCE OF FUNDS

Financial institutions – the financial intermediaries – far exceed individual suppliers of funds. However the institutions are not an autonomous source of funds; they merely reinvest the moneys of their individual policy holders and savers. The amount of funds shown supplied by individuals on their own account appears to be relatively small. This is a strategic item, however, because although the data is not available, it is generally presumed that this is the largest source of financing for new enterprise.

In Table 2 we have the breakdown of corporation use of the capital market according to type of issues. The low interest rates that have prevailed since the 1930's and the income tax deductibility of interest seem to have encouraged debt issues over stock. A larger proportion of debt is retired every year than common stock, and that on a net basis the issuance of debt has been five times the issuance of equity since 1971. Moreover,

Table 2. Gross Proceeds of New Securities of All Corporations Offered for Sale for Selected Years 1935-2000 (in millions of dollars)

Calendar Year	Gross Proceeds from Issues of Bonds, Debentures and Notes	Gross Proceeds from Issues of Common Stock
1935	$2,224	$22
1940	2,386	108
1945	4,855	397
1950	4,919	811
1955	7,420	2,185
1960	8,081	1,664
1971	37,809	10,146
1975	97,088	18,819
1980	179,633	44,254
1985	357,436	83,347
1990	696,799	53,944
1995	1,197,158	97,636
2000	2,748,933	392,684
2003	2,645,478	172,294

Source: Securities and Exchange Commission, 27^{th} Annual Report, Compustat Database

the use of equity is understated because the largest part of equity finance arises from the retention of earnings rather than new issues. In general, Table 2 shows a sharp increase in corporate use of the capital markets since 1975. This has been a true "growth industry."

In the late 1930's and the early 1940's, financial writers were predicting the demise of the capital markets as a source of long-term financing. Firms were doing most of their long-term financing internally through depreciation and retained earnings and were divorcing themselves from any reliance on external financing, i.e., the capital markets. Even as they wrote, however, there were indications of a recovery in the capital markets.

Table 3 depicts the relative importance of internal financing and external financing sources. Internal financing looms very large in financing firm growth. The capital markets allow firms to raise capital to support capital expenditures and generate future profits. Nevertheless firms generate most of their sources of funds from retained earnings, net income less dividends. The capital markets, as we will see in Chapter 8, evaluate the effectiveness of the

Table 3. Financing of U.S. Corporations for Selected Years, 1971-2003 ($B)

Sources:	1971	1975	1980	1985
Internal	76.2	127.1	260.9	363.1
Retained Profits	28.6	51.1	112.7	109.3
Depreciation	47.6	76.0	148.2	253.8
External	29.3	64.3	130.1	165.4
Net Debt	17.2	47.1	94.5	137.8
Net Equity	8.2	17.2	35.6	27.6
Sources:	1990	1995	2000	2003
Internal	504.9	916.1	1557.0	1477.4
Retained Profits	120.4	312.8	526.7	601.7
Depreciation	384.5	603.3	1030.3	875.7
External	146.1	349.0	1203.6	497.9
Net Debt	148.8	324.9	1055.6	525.1
Net Equity	-2.7	24.1	148.0	-27.2

Net Debt = Debt Issued – Debt Repurchased
Net Equity = Equity Issued – Equity Repurchased

Source: Standard & Poor's, Compustat

firm's retained earnings policy by establishing a price-earnings multiple for the security. A higher price-earnings multiple often shows confidence in management, among other things. Nevertheless, although depreciation is counted as one of the sources of funds, it is part of the gross savings of the economy, not net. Over time, depreciation tends to approximate capital consumption. Fixed assets must be replaced eventually. Corporations earned net income of $11,437.8 billion during the 1950-2003 period. The corporations paid dividends of $5,815.6 billion during the period implying a dividend payout ratio of approximately 51 percent. Amortization and depreciation charges totaled $13,550 billion during the corresponding period. Cash flow, net income plus depreciation, totaled approximately $25 billion. Corporations raised $288.7 billion of new debt issues, and $33.9 billion of new equity issues; however, if one calculates net debt and equity issues, defined as new debt issues less debt repurchased, and new equity issues less equity repurchased, one finds that nets debt issues totaled $7,715 billion during the 1950-2003 period, whereas net equity issues were $915 billion. Thus, net debt issues exceeded net equity issues by a 8.4:1 ratio. Moreover, the internal generated cash flow totaled $25 billion, whereas net debt and equity issues totaled \$8.63 billion. Internal financing is the greatest source of corporate financing. Internal funds, defined as retained profits and depreciation, exceeds external funds, defined as net debt issues plus net equity issues, during much of the 1950-2003 period. Internal funds totaled \$19,172 billion for the 1950-2003 period, whereas external funds totaled \$8,630 billion. Depreciation has become the largest source of internal funds (see Table 3). Depreciation has exceeded retained profits during the 1971-2003 period. Net debt issues dominate net equity issues. External financing rose relative to internal financing during the late 1990s and early 2000s, but still fell short relative to internal financing because of depreciation. The capital market, especially in recent years, is a significant supplier of savings for net capital formation. The relative insignificance of IPOs is shown in Table 4, where IPOs, Public Offerings, and Mutual Fund Assets are shown. Mutual fund assets dwarf IPOs and are 2-3 times the amount of public offerings during the 1980-1998 period.

Table 4. Industry Statistics: Public Offerings and Mutual Fund Assets

	1980	1985	1990	1995	1998
Public Offerings: IPOs Registered with SEC	1.3	90.0	50.0	122.0	257.0
Public Offerings (excluding Private Placements)	58.0	133.0	309.0	705.0	1,819.0
Managed Funds: Assets under Management by Investment Companies	235.0	591.0	1,350.0	2,879.0	5,180.0
Mutual Funds	135.0	495.0	1,065.0	2,812.0	5,525.0

Source: SEC, 1999 Annual Performance Report.

12. THE DEBATE ON THE OPTIMAL ORGANIZATION OF THE CAPITAL MARKET

In the European continental capital markets and in Japan, the various financial functions are quite integrated. Thus it is quite common for the commercial banks to sell insurance to their clients and perform the brokerage function, buying and selling shares and bonds for their customers. Until recently, in the United States and Great Britain, there has been a tendency to keep various financial institutions independent so that for example the transactions between a bank and an insurance company would be at arms length. The growth of holding company financial companies owning insurance companies and brokerage company subsidiaries, and brokerage companies offering a variety of banking and insurance options have begun to blur the boundaries.

Putting activities under one roof may increase "transaction efficiency." It can lower transaction costs. However, as shown in the recent case of Merrill Lynch's financial advisors lying in bed with its new issue branch and promoting risky new issues to their customers, a source of abuse can arise when the presumed neutral financial advisor and the seller wear the same uniform. The advantages of transaction efficiency can soon evaporate if the external investor begins to doubt that he is getting the benefit of an "arms length transaction" and operating in an unbiased market. A loss of investor confidence raises the risk premium on all financial sources and taxes the economy across the board.

13. CAPITAL MARKETS AND LONG TERM ECONOMIC GROWTH

The capital market is an institution of tremendous importance. It may be enlightening to sketch its influence on three levels: how it affects investor, corporation management, and the economy as a whole. From the viewpoint of the investor the prices shown by the securities market is the considered judgment of his peers on the success and potential success of the company in which he has put his funds. The attitude he will have toward the management, his willingness to put more money in the company or similar companies will be affected by the verdict of the investment market.

The securities markets play a significant role in the managerial and financial decisions of the large publicly held corporations. The security markets affect the stockholder's attitude toward the corporation and its management. The verdict of the securities market reflects what sophisticated investors think of the success and potential of the company. From the operational viewpoint of the corporation's financial management, the security or capital funds markets are a source of long-term capital. Through the machinery of the capital markets and the investment bankers, the corporation can obtain funds from long-term debt issues (bonds or debentures) or by increasing its equity (floating more stock).The financial management of the corporation must understand these markets and the relations between the primary and secondary markets if it is to make careful, rational decisions on problems of long-term financing.

From the view of the economy as a whole, the activities of the investment markets play a major role in capital formation and economic growth. The tradition of investing savings in securities is quite strong in economically developed countries; in other parts of the world savings are too often placed in precious metals, jewelry, or land rather than invested in productive enterprises.

The investment markets are in nature international as well as national. The securities of many large foreign corporations are listed on the American exchanges, and efficient machinery exists for buying foreign securities from foreign exchanges or co-listings. The vast apparatus of the financial market serves an essential service in a free enterprise economy of allocating a large portion of new capital formation among various firms, countries, organizations, and governments.

Notes

[1]English practice distinguishes between "public corporations" (basically our widely held corporations) and "private corporations."

[2]Source:www.nyse.com

[3]Quoted from a letter by Leverett Lyon appearing in the *Wall Street Journal*, March 20, 1955.

[4]In a price or market economy the process of allocation starts when increased demand raises profits or rates of return in a given industry or segment of the economy, or decreased demand lowers profits. However, the security markets are quick to recognize such portents and mark prices up or down accordingly.

[5]If *net* new funds are invested in the secondary markets, some portions of old portfolios – securities – will have been liquidated, turned into cash. Since it is unlikely that all of these funds will be spent on consumption, a large portion must be reinvested in the primary market, i.e. net new securities.

[6]If the firm is legally a single proprietorship or partnership, it must, of course, first organize as a corporation before it can sell shares.

[7]None of these arrangements need be perpetual. Companies have sold off all or part of their investment in a subsidiary or "spun off" the shares to their own stockholders. In other instances, a parent company has purchased the public's holding in a subsidiary.

[8]Of course, the exemption of issues from federal pre-registration, which are under the minimum amount, does not excuse the promoters of such securities (nor, as a matter of fact, the promoters of registered securities) for violations of pertinent state statutes nor from the penalties of the general antifraud provisions of the common law.

[9]Pre-emptive rights are not confined to issues of common stock but may be extended to the issue of other types of securities if these are *convertible* to common stock.

[10]In the feverish era of the 1920's initial margin went as low as 10 percent.

[11]See F.A. Bradford, *Money and Banking*, Longmans, Green, 1949, p. 800.

[12]This authority over financial affairs should not be confused with the rate-regulating function given to the various state Public Utility Commissions and to the Federal Power Commission for interstate business.

[13]This act follows many of the provisions suggested by Henry Simon in his pamphlet "A Positive Program for Laissez Faire," University of Chicago, 1935, reprinted in *Economic Policy for a Free Society*, University of Chicago Press, 1948.

[14]*www.sec.gov/about*

[15]SEC Annual Report, 2003, pp. 44-52.

[16]www.sec.gov/news/press/2004-174.

[17]C. Leuz, "Why Firms go Dark: Causes and Economic Consequences of Voluntary SEC Deregulations," working paper, The Wharton School, University of Pennsylvania. See also R.E. Verrecchia) and C. Leuz "The Economic Consequences of Increased Disclosure." *Journal of Accounting Research* (2000).

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Problems

1. The directors of the Thistlewaite Corporation need $5,000,000 to finance a new plant. The Prudence Insurance Company is willing to loan the company $3,000,000 on a privately placed long-term mortgage, provided the corporation increases its own equity by $2,000,000. Through what sources can the Thistlewaite Corporation get an additional $2,000,000? Explain.
2. The Thistlewaite Corporation decides to float new commons tock to obtain the $2,000,000 – at $50 per share. How many shares do they need?
3. Their present capital position shows 500,000 shares authorized, 360,000 issued. The market price of the outstanding Thistlewaite shares is $76.
    a. Explain the use of the pre-emptive right in this situation. What would be the value of a right?
    b. What would be the value of a right if the commons tock rose to 82¼? If it fell to 71½?

Chapter 8

THE EQUITY OF THE CORPORATION: COMMON AND PREFERRED STOCK

This chapter deals mainly with the financial function of the shareholder, i.e., the supplying of risk capital and the expected rewards thereof. The shareholders' expected return is the supply cost of equity capital. Only if the firm is able to give its shareholders at the minimum the "normal" rate of return on risk capital, can the company be considered an economic success. Thus, a large part of the discussion is centered on the behavior of the investment markets. This follows from the assumption that the major objective of financial management is to maximize the long-run value of the common stock. If management is to develop financial strategies aimed at maximizing the long run value of the common stock, it must understand the rationale of the investment markets. It is this market that measures relative risk and provides approximations of the rates of return on different classes of risk capital.

1. COMMON STOCK

1.1 Common Stock as Risk Capital

The basic function of the shareholder is to furnish risk capital. All the creditors and investors in the firm take some risk, but because the claims of the common shareholders are subordinated to those of all the others, the common stock absorbs the initial brunt of any downturn.

The owner of the common shares of the corporation receives no definite rate of return. The corporation owes no contractual obligation to pay any fixed amount to its owners. The return to the shareholders depends on how much is left after bank debts, bonds, and other obligations which have been acquired at a fixed rate have been serviced. As long as the earnings of a business are subject to external variation, at least one class of capital suppliers must be content with a variable return. A firm could not promise fixed returns to the short-term creditors and bond owners, if there were no equity holders willing to take whatever earnings are left or to absorb losses. The equity holders bear the initial risks of operation; the debt holders' return is not usually endangered until the earnings of the shareholders shrink or turn into losses.

The investments of the creditors are safe until the equity can no longer absorb the loss of asset value. The equity of a corporation is a shield protecting the debt holders. Other things being equal, the proportion of ownership capital to total assets affects both the safety margin of earnings before the fixed interest charges and the asset safety margin of the debt holders.

Shareholders bear the initial economic risks of the firm, but they are rewarded with the residual earnings left after all operating expenses, financial charges, and taxes are deducted; in a successful firm, the residual earnings exceed the fixed returns promised to the creditors. The reader is referred to the income statements of IBM, Dominion Resources, and DuPont discussed in Chapter 4. The net income of a corporation is most often expressed as a percent of sales, total assets, or stockholder equity, as the reader saw in Chapters 4 and 5. The earnings of the common stockholders are calculated only after the expenses, interest charges, and profits taxes are deducted. Though the shareholders' reward comes last, they have one great advantage; their return is not contractually fixed or limited. As legal owners of the company, entitled to all the earnings left after the creditors and the preferred shareholders receive their fixed return, they receive the rewards of successful operation and company growth. If sales increase, if profitable new products are introduced, or cost-saving techniques are successfully applied, the increased returns redound mainly to the benefit of the stockholders. Those who take the larger end of the risk do not necessarily lose. When both dividends and appreciation of capital are taken into account, a "long run" investment in a diversified portfolio of common stocks has generally proven more profitable than investment in any other type of security.[1] Various statistical tests lend support to the historical validity of this conclusion, which has been called "the common stock theory of investment."

Of course, the superior performance of common shares in the past is no guarantee of gains in the future. The long-run nature of the test periods (twelve to twenty years, or even 54 years as in the WRDS database) is no comfort to the short-term speculator or to those who wish or need an assured amount of money at a given time, and the selection of an improperly diversified or over-priced portfolio can surely lead to losses. Nevertheless, the data indicates that in general those who have risked funds in the ownership of corporation shares have not gone unrewarded.

2. REWARDS OF COMMON SHAREHOLDERS

The returns to the outside shareholder of a corporation fall into three categories: dividends, earnings, and capital appreciation on the market price of the stock. These categories are not independent; the emergence of capital appreciation depends heavily on the future course of earnings. The two explicit measures of return are the dividend yield, current dividends divided by the market price, and the p/e ratio, current earnings divided into the market price (the reciprocal is the earnings rate).[2] Implicit in the valuation of shares is g, the expected growth rate of earnings.

Buy Backs The two cash returns that shareholders may expect to receive from their holdings are buy backs and dividends. Buy backs are a program where the corporation periodically uses a proportion of its cash flow earnings to buy back its shares from the open market. A buy back reduces the amount the firm re-invests in the business and is a full or partial substitute for dividends. Currently the cash amount of buy backs exceeds the amount of dividends. Under past tax policy where dividends were fully taxable at the personal level but capital gains if any were capped at 20%, buy backs had a tax advantage. (Hopefully an eventual sensible tax reform would allow a full or partial deduction of dividends at the corporate level. This would do much to restore dividends as the main cash pay out program of the corporations.)

Buy backs and dividends seem at first glance to be different creatures. However at the internal corporate level, the two have the same effect; they reduce the amount of cash available within the corporation and they reduce the proportion of equity in the financial structure. For the shareholder, receiving a dividend gives him cash, and all else remaining equal, the value of his share holdings remains the same. In case of a buy back, the “universal shareholder” receives cash for a portion of his shares and now holds fewer shares. However, the divisor (the number of shares) against total earnings has been reduced, earnings per share increases, and thus the price of each of the remaining shares should rise. Fewer shares times a higher price per share, all else being equal, the value of the portfolio should stay the same, just as in the case of dividend payouts.

Equity repurchases (buybacks) are generally motivated by several factors. First, equity repurchases, as contrast with dividends, serves to increase the earnings per share, and thus lead to a possible increase in the stock price. Equity buybacks increase the financial leverage of the firm, and are often used in mergers and acquisitions and stock option plans. Buybacks may be viewed as flexible dividends, by investors who do not want cash from the sale [Bierman (2001)]. Equity repurchases may be a good use of corporate cash, and can be viewed as an investment. Buybacks enhance the value of the book value of the remaining shares, particularly if the shares are repurchased at a price less than the current book value. Bierman (2001) holds that the primary advantages to share buybacks are:

1. The tax shield that occurs when the firm repurchases stock. A portion of the transaction is regarded as a return to stockholders capital and not taxed, generating increased after-tax cash flow, whereas the increase in stock prices generates capital gains, taxed at 20 percent, as opposed to dividends taxed as ordinary income, at a rate of 35,000;
2. The lower transactions costs for investors who do not sell, and increase their "investment" in the firm;
3. A higher stock price than paying an equivalent dividend;
4. Hiding dilution effects of issuing stock options;
5. Supporting the stock price;

Of course one important difference remains. Dividends go willy nilly to all the shareholders; during a buy back some shareholders may sell varying proportions of their holdings and others may hold on to all their shares.

Dividends If a firm is making some earnings, has cash resources, and is reasonably well established, the management often endeavors to set up some sort of dividend policy. Generally dividends are paid out of current earnings and constitute an interim sharing of the profits of the enterprise. The proportion of earnings distributed as dividends is the payout rate.

The board of directors is not legally obligated to declare dividends. Failing to pay dividends on stock is not an act of bankruptcy, as is the failure or inability to pay the interest on debt. This flexibility of return – the ability to forego, postpone or cut dividends – makes capital stock the safety element in a firm's financial structure.

For a purely dividend paying company, the expected flow of dividends sets the basic value of a company's shares. If a stock has a current dividend of \$2, a forecasted growth rate of 3.0% per annum and the market desires an overall rate of return of 9 per cent, the stock would have a market price of about \$33.33 $\left(\frac{\$2.00}{(.09-.03)} = \$33.33\right)$ and a current yield of 6.0%.

Various aspects of risk raise the yield rate on common shares and reduce the relative market price. On the other hand, the prospect of a growing stream of earnings and dividends raises the market price and reduces the present yield. The expectation of a growth in earnings and dividends will lower current dividend yields below the interest yield on sound bonds.

Thus the expression:

$$\$1+\frac{1}{(1.08)}+\frac{1}{(1.08)^2}+\frac{1}{(1.08)^3}\ \cdots\ \frac{1}{(1.08)^n}$$

carried to a large number of times, eventually sums to \$12.50, but the unlimited progression of

$$\$1+\frac{1(1.08)}{(1.08)}+\frac{1(1.08)^2}{(1.08)^2}+\frac{1(1.08)^3}{(1.08)^3}\ \cdots\ \frac{(1.08)^\infty}{(1.08)^\infty}$$

has no finite number. Presumably a stock whose dividend is expected to grow at a rate equal to or above the going yield rate for an indefinitely long period could fetch an infinitely high price on the market. But, in the long run dividends based on earnings cannot grow above the yield rate forever. Nevertheless, prospective growth will raise the stock price, raise the p/e ratio, and lower present yields.

3. THE CORPORATE SECTOR: A NET EXPORTER OF FUNDS

There is a "balanced economic growth model" which carries the assumption, that the amount of income from capital equals the total of aggregate savings and real investment and that perforce the rate of return on capital and the growth rate of the economy are equal. However, the cash flow generated by the operating assets exceeds the amount of possible net real investment, and it necessarily follows that at the end of the fiscal period, the overall corporate sector will have more funds than it can desirably re-invest in the business. In short, the data shows that if in any given year the growth rate is 4.0% and the aggregate after tax earnings on the real value of *corporate equity* is 8.0%, than the corporate sector one way or another will distribute about 50% of its equity earnings or profits to the rest of the economy. The outflow of cash in the form of dividends, interest paid on debt, buy backs, and repayment of debt has substantially exceeded new funds raised on the capital markets, primary raised by issuing debt. The reader is referred to Table 1.

Table 1. The Corporate Sector Net Exports of Funds 1971-2000 ($MM)

	Year						
Fund Sources/Uses	1971	1975	1980	1985	1990	1995	2000
Debt Issued	$35,762.8	84,427.6	144,809.8	299,454.4	625,378.4	1,156,219.5	2,204,155.7
Equity Issued	9,262.5	14,611.9	37,132.9	76,050.7	51,664.4	118,036.6	360,740.4
Debt Repurchased	19,907.5	45,473.0	75,759.6	118,685.9	485,998.4	838,614.1	1,546,809.7
Equity Repurchased	1,585.3	1,501.3	7,959.1	51,989.7	52,183.7	88,825.8	230,042.4
Net Debt	15,855.2	38,954.6	69,050.2	111,798.5	139,380.0	317,605.4	657,346.0
Net Equity	7,667.2	13,110.9	29,173.8	24,061.1	-519.4	29,210.8	130,698.0
Dividends	23,743.6	33,438.9	67,759.3	100,397.8	163,604.3	228,352.1	303,767.2
Interest Paid	20,331.2	44,028.2	97,911.8	161,184.8	338,105.4	357,941.9	634,214.4
Net Exports	20,542.3	25,401.9	67,447.1	56,753.1	362,849.0	239,477.8	149,938.3

In 1990 (and 2003, not shown), the corporate sector exported over $ 350 billion of funds. The surplus of funds over any possible reasonable capital investment policy is the rationale behind the cash buy back of shares and the payment of dividends. In short, perforce, the corporate sector is a net exporter of funds to the rest of the[3] economy.

Earnings. The investor's cash returns, buy backs and dividends, are a fruit of the company's earnings. The level of current and projected earnings impacts dividend policy and potential buy backs. A forecast of dividend levels can be obtained by studying past payout rates and attempting to predict future earnings levels. Dividend policies show a high correlation of dividends with earnings, although as earnings rise, there is usually some lag before former payout levels are resumed. Buy backs are more difficult to predict. In the past, before the prevalence of buy backs, if a company had a "normal" dividend payout policy, the prospective investor would not be far wrong if he concentrated on the trend of earnings in evaluating the worth of a share of stock.

The amount left after common dividends are paid represents retained earnings or earnings reinvested in the firm. Retained earnings add to the equity of the common shareholders, and the amount of correlated funds can be used to finance additions to the operating assets of the corporation or to retire debt.

Additional assets, properly employed, should add to the future earnings of the corporation. An increase in assets financed by ownership capital as opposed to debt improves the credit standing of the firm and enables it to acquire debt funds at a relatively lower rate. Funds represented in earnings should increase the future profits of the shareholders and eventually result in buy backs or higher dividends. It is not the increment in the book value of the shares, but a hoped-for sequence of increased earnings that makes retained earnings of value to the shareholder.

Capital Appreciation If the shareholder sells his shares at a higher price than he paid for them, the difference is called capital appreciation or capital gains. The reverse can be true and the sale of securities may show a capital loss. However, a long term investment in a portfolio of common shares almost always out-performs a comparable investment in other financial assets. Essentially as one might expect, there is a net return for bearing risk.

Capital appreciation develops from growth in earnings or from a decline in the basic discount rate or a favorable reevaluation of the company's risk.

If the market re-evaluates a stock favorably, assigning it plus factors for future growth, increased dividends and buy backs and greater stability all at once, the stock can show a rapid rise in price in a brief span of time. However, the market for common stock is notoriously volatile, and a wave of optimism as to the future of the economy and the share of corporate earnings can send the general level of stock prices unsustainably high. Widespread pessimism can have the opposite effect.

4. DEFINITIONS OF THE VALUE OF COMMON SHARES

Par Value. Par value is basically a legal concept that sets the minimum initial price at which the company's shares are sold at the time of organization. (Par value can be changed through reorganization, recapitalization, or through stock splits.) Any initial sale of stock at a discount from par presumably involves a legal obligation which the creditors can press against the holder of the stock should the company ever fail. In some jurisdictions the issue of stock at a discount from par is illegal; in any case, it is extremely rare. (This is why almost all stock certificates bear the notation "fully paid and nonassessable.") The dollar amount of stocks sold at par comprises the capital stock account. In most jurisdictions no dividends can be declared unless there is a positive balance in the surplus account sufficient to cover the dividend. If the books show no surplus, no dividends can be declared under this rule even though there might be considerable current earnings. In short the general rule "prohibits dividends out of capital."

Historically, par value was designed to serve a twofold purpose. It set up a sum of paid-in capital to act as a trust fund for the creditors of the corporation in lieu of the unlimited personal liability of the owners. It was also to act as assurance to a subscriber for the original shares that other shareholders were purchasing their shares at an equal price. In practice par value has served neither of these two functions very well. Credit ratings are more likely to be based on earnings potential, safety and liquidity of assets, and total financial structure than the presumed last line of defense shown by the capital stock account. Furthermore, any attempt to favor stockholders by giving them dividends at a time when the firm appeared unable to meet its credit obligations would constitute an act of "involuntary bankruptcy" and could be halted by invoking bankruptcy proceedings. Both aspects of par value, including the assurance that all are venturing equally in the new company, are considerably vitiated by the fact that the directors have wide discretion in valuing non-cash assets exchanged for common stock. Essentially, the investor in a new venture must estimate and study all of the potential rewards and risks and not rely upon the fictitious safety of par value.

Because of the mistaken impressions par value has on occasion given to the investor, and because of its disadvantages in the initial issue, there has been a large growth in the employment of no-par value stock. With an issue of no-par stock the directors have some discretion as to how much is to be allocated to the capital stock account and how much to the paid-in surplus account. A great advantage of no-par is that if the initial operations of the company do not go well, additional equity capital may be raised by selling new shares at a lower price than the original issue. With par value shares, this might be difficult to accomplish because it would be illegal to sell the second flotation at a discount from par. However there have been some tax difficulties with no-par shares; in New York State, for example, these shares have been given a constructive value of $100 par for purposes of calculating the transfer tax on their sale. Mainly because of this problem, the most popular issue today, replacing no-par stock, is low par stock. These shares may have par values such as $1.00, $3.00, or $5.00, and are usually floated at a price considerably higher than their par value. This stock has most of the advantages of no-par stock without being subject to possible extra burdens under the franchise or transfer tax.

Book Value The book value is the net balance sheet asset value per share. It is obtained by subtracting liabilities and preferred stock from the accounting value of the total assets and dividing the remainder by the number of common shares outstanding. Book value may be used in certain financial comparisons. It is sometimes useful to see which of a set of companies earns a greater percentage on its book value. Because book value is increased with additions to retained earnings, tracing the course of book value over time shows how much net internal financing the company has used. (This historical analysis becomes difficult if any stock dividends have taken place.) The usefulness of book value for financial analysis is reduced by the time changes in price levels and variations in depreciation policies, which result in a wide difference between the balance sheet accounting value of the company's assets, and their current economic value.

When the market is pessimistic or depressed, stocks may tend to sell below book value; in a buoyant or optimistic market, shares are generally priced above book value. Growth companies, which show a strong upward trend in earnings, may sell at a considerable multiple of their book value. The statistical association between equity holding period returns and book value of stockholder equity will be calculated in Chapter 14.

Market Value The relative market price of a corporation's shares is an index of the firm's success. To the so-called value investor, the market price of the stock relative to its prospective yield is the vital datum.

Market price is set by the investors' projection of the firm's potential earnings discounted by the going rate of return for the type of firm. The market price relationship is usually summed up in the going price/earnings ratio. A relatively high p/e ratio indicates that the market has hopes for growing earnings from the firm, and a low p/e ratio suggests fear for the future. The price/earnings ratio sometimes rises with a drop in corporation earnings which the investors believe to be temporary.[4]

Intrinsic or "Normal" Value Intrinsic value is an idealized concept. It is the price a stock would sell at if the market was supposedly not subject to psychological aberrations.[5] Under the method given by Graham and Dodd, intrinsic value is approximated by studying the past level of earnings, earnings trends, and the pattern of dividends. (Buy backs did not appear in the Graham and Dodd model.) A capitalization rate based on standard levels modified for various qualitative factors affecting the particular firm is applied to a weighted combination of earnings and dividends. The result is an intrinsic or normal value.

Graham and Dodd's basic formula was:

Intrinsic Value = $M\left(\frac{E}{3} + D\right) \pm$ asset factor.

M represents a "normal capitalization multiplier" which ran from 8 to 15 for ordinary industrials – with lower multipliers given for highly leveraged and volatile companies and the higher multipliers reserved for stable and blue chip companies. E is the projected earnings per share, generally based on the average earnings of the last five years corrected for any pronounced trend. The figure for earnings is divided by 3, and then D, the projected dividend, is added to the multicand. The amount for D is generally based on the dividends of the last five years. When a company's payout rate approximated 66% percent, M approaches the pure earnings multiplier. The asset correction is used to reduce the intrinsic value if it exceeds book value by too large an amount; a plus correction is made if intrinsic value based on earnings falls below the rule-of-thumb "liquidating value" per share.

Graham and Dodd admitted the difficulty of applying the formula to very new companies, to high-risk situations, to highly leveraged companies, and to strong growth companies.

According to the intrinsic value theorists, share prices at any time may swing well above or below intrinsic value, but they tend to return to it over the long run. Although long term economic growth and stability have raised expectations and raised the p/e multipliers above those proposed by Graham and Dodd and although buy backs have vitiated the emphasis on dividends, there is still a sense in which the intrinsic value concept influences managerial decisions. The determination of the cost of equity financing cannot be based on current market data unless the company's shares are selling within some "normal range." A growth firm whose stock is selling at a relatively high price cannot use the explicit current market rate of return as its cost of equity funds, but must develop an implicit cost based on some normative valuation.

Liquidation Value. If all the assets of a company were sold off, all creditors paid in full, and the preferred stockholders paid the voluntary liquidation price, the remainder per share is the liquidation value. In practice, the exact liquidation value of the shares cannot be known unless this process (which unfortunately is not reversible) were carried out. Rough estimates of the liquidation value can be made by experienced appraisers estimating the realizable value of the assets. The accuracy of such estimates varies considerably for different types of assets. In general, the receipts from current assets and land can be estimated more accurately than the amount which might be recovered from plant and equipment.

A crude index of liquidation value has been developed by the investment analysts. This measure is called "net current assets" per share and is obtained by subtracting all liabilities and preferred stock from the current assets and dividing the remainder by the common shares. No value is given to plant and equipment, but on the other hand it is assumed that no loss will be incurred in the liquidation of the current assets. Net current asset value is in a sense a minimal liquidation value.

When the shares of a company sell for any considerable time below their liquidation value, it indicates either extremely poor management or that the capital of the business is employed at a rate of return lower than that obtainable in other industries.

The company may be ripe for seizure by a new management group. The new managers may try to raise the rate of return, merge with another company, or engage in a partial or complete liquidation of the firm. From an overall economic viewpoint, the demise of such a company is not distressing; presumably the resources released could be more productively employed elsewhere.

Stock Splits and Stock Dividends. A stock split is a financial maneuver by which the book value of each share is reduced but the holders of outstanding stock receive certificates for new shares pro-rated on their present holdings. After a stock split of 2 for 1, a holder of 100 shares of a corporation holds 200 shares; after a split of 3 for 2, she holds 150 shares. The book value of the shares is reduced proportionately by the split, as are the earnings on the new shares. Nothing on the balance sheet changes; the surplus and capital stock accounts have the same totals, but in the information attached to the balance sheet the number of outstanding shares is increased. A stock split gives the share owners nothing of value that they did not have previously. Nevertheless, the investment market tends to react favorably to a split. Rumors of an impending split generally send the price of the stock upward. A potential favorable effect of the stock split may be to bring the price of the shares down into a more marketable range. The reduced base price draws increased trading interest and adds a slight increment to the market price. Another presumed favorable aspect of a split is the “announcement effect,” the assumption that the split implies an optimistic management view of the prospects of the firm.

A stock dividend is the distribution of new shares to the present stockholders, reducing the surplus account and crediting the capital stock account on the corporation’s books.[6] Its effects are similar to those of a stock split, although the accounting formalities differ slightly. A stock dividend runs only from about 2 to 10 per cent of the shares in contrast to the much larger division of the stock split. In a stock dividend the par value of the shares is left unchanged. However, a larger number of shares is now divided into the same total equity, and the book value of the stock is lower. The earnings per share is also reduced proportionately. The stock dividend brings the stockholder nothing of objective value except as it may raise the effective cash dividend rate. The usual stock dividend is under 10 per cent, and generally the cash dividend rate on the shares remains unchanged. Thus a 10 per cent stock dividend is usually equivalent to a 10 per cent rise in the cash dividend and probably has a positive effect on the value of the investor's portfolio.

Federal tax laws do not consider a stock split or a stock dividend personal income. The stock split or stock dividend is used to reduce the acquisition cost of the shares, so that, in case of any partial liquidation of the portfolio, capital gains or losses may be properly calculated.

5. STOCK PRICES AND DIVIDENDS: AN EXAMPLE

Stock values are determined, to a great extent, by the expectations of earnings and dividends growth. Let us examine the case of Dominion Resources, D, the holding company of Virginia Electric & Power Company (VEPCO), as of October 2000. The current price of D was $53.25. The respective dividend and earnings per share data were:

	1999	1998	1997	1996	1995	1994	1990
Dividends	$2.58	2.58	2.58	2.58	2.58	2.55	2.32
Earnings	$2.81	2.75	2.15	2.65	2.45	2.81	2.92
Payout Ratio	.92	.94	1.20	.97	1.05	.91	.78

The reader notes that Dominion Resources is maintaining its dividend per share during the 1995-1999 period, despite the volatility of its earnings per share. How can one determine the fair market value of Dominion Resources stock, P? Let us use the Williams/Gordon discounted dividends stock valuation equation.

$$P = \frac{E(DPS)}{k - g}$$

where E(DPS) = dividend per share,
k = required rate of return,
and g = growth rate.

Gordon assumed in his model that dividends and earnings growth is equal. This is not a reasonable assumption for Dominion Resources during the 1990-1999 period.

$$g_{eps} = \sqrt[9]{\frac{eps_{1999}}{eps_{1990}}} = \sqrt[9]{\frac{\$2.81}{\$2.92}} = -.004$$

$$g_{DPS} = \sqrt[9]{\frac{DPS_{1999}}{DPS_{1990}}} = \sqrt[9]{\frac{\$2.58}{\$2.32}} = .012$$

The nine-year compounded earnings per share growth is -.4 percent, whereas dividends grew at a 1.2 percent. One will use the nine-year historic dividend per share growth to price the stock.

What should one use for the required rate of return? We can use the required rate of return, k, from the Capital Asset Pricing Model, which we develop in Chapter 14. The required rate of return on equity is an opportunity cost that the investor incurs by purchasing the stock. That is, the stock must produce a return that is consistent with its level of risk. The return of a stock is determined by its dividend payments, and its stock price appreciation. Investors must be compensated for bearing risk, and risk is measured by the stock's beta, its measure of systematic risk. The S&P 500 beta for D is 0.20, a defensive asset in that if the market is expected to rise by 10%, then Dominion Resources stock return is expected to rise by only 2%. We will estimate a beta in Chapter 14.

The 90-day Treasury bill yield is 3.5 percent in October 2001, and the expected market equity premium of stocks relative to Treasury bills historically is 8.8 percent. The required return on return for Dominion Resources is 5.26 percent.

$$k = R_F + [E(R_M) - R_F]\,\beta;$$
$$k = .035 + (.088)(.20) = .0526$$

The market's required rate of return is 5.26 percent; we should purchase Dominion Resources if we expect the stock to earn more than 5.26 percent. An alternative strategy, yielding the same answer, is to price Dominion Resources shares, and compare its fair market value to its current stock price:

$$P = \frac{\$2.58(1.012)}{.0526 - .012} = \$64.29$$

In October 2001, one could have determined a fair market value for Dominion Resources of \$64.29, far exceeding its current stock price of \$53.25. One should purchase Dominion Resources.[7]

The current date, as the authors write this chapter is August 23, 2004. The current three month Treasury Bill yield is 1.41 percent, the current Dominion Resources beta is 0.23, and the 10-year growth in earnings per share for Dominion Resources is 0.65 percent (the ninth root of \$2.98 in 2003 divided by \$2.81 in 1994), and Dominion Resources pays a \$2.58 dividend (still). The current fundamental value of Dominion Resources is:

$$k = .014 + .088\ (.23) = .032$$

$$P = \frac{\$2.58(1.0066)}{.032 - .0065} = \$100$$

The current price of Dominion Resources is $64.58.[8] One should purchase Dominion Resources as it is substantially under-valued. One could calculate dividend discount models for all exchange traded stocks in the US (and globally) and rank the stocks relative to their stock price deviation from fair market value. Alternatively, one could use a multi-factor stock selection model to quantify the purchase decision of stocks. The authors prefer the latter method that is developed in Chapter 14.

6. NON-CASH PAYING GROWTH SHARES

The value of any corporation stock is its current or its potential future cash throw-off either in the form of dividends, cash buy backs, or purchase by another company. At any point of time, there are shares on the market that currently pay no dividend and show no buy back policy but still command a positive price. The value of such shares is based on an expectation or forecast that sometime in the future the shares will yield a cash throw off. If the shares are those of a *super growth company,* one whose periodic earnings grow at a rate in excess of the normal capitalization rate, the current market price will be quite high.

Super growth cannot be infinite; sometime in the future, the firm's growth rate will slow to some norm, the company will begin to throw off cash either in the form of buy backs or dividends, and the price of the shares will be evaluated on the basis of the earnings reached at this time. The current market price of the shares is the present value of this future price. An example of the valuation of a non-cash paying, fictional growth company, Crampton Inc., is presented below. The formula for the valuation of the shares follows:

$$\text{Current price} \approx \frac{E(1+g)^n \text{ x M}}{(1+i)^n}$$

where:
E equals the current earnings
g is the expected average super growth rate
M is a "normal" market multiplier
n is the forecasted period of super growth, and
i is a risk adjusted desired rate of return.

The data for the fictional Crampton Corporation:

- Crampton's current earnings per share is $1.00
- The current growth rate of earnings is 30% per annum[9]
- The forecasted growth period is 20 years
- The risk adjusted rate of return is 9.0%.

The final value of the shares is obtained thusly:

- At the end of 20 years, earnings compounded at a growth rate of 30% p.a., equals $190
- The future price of the normalized shares with earnings capitalized at 9% (M = 11.11), equals $2,111
- The present value of a Crampton share, $2,111, discounted at 9% for 20 years, equals $376.

Under this supposed scenario, the p/e ratio could be as high as 376 times current earnings. Of course, financial disaster follows if the growth period is shorter than 20 years and/or the growth rate does not reach 30%. On the other hand, much money can be made if the reverse is true or if the investor jumps in at a lower price before the market recognizes Crampton's potential.

An argument sometimes presented against any valuation of long term deferred returns is that an investor would be irrational to buy an investment whose cash payout is beyond her expected life or planning horizon. The argument does not hold as long as a market exists containing sufficient purchasers with differing and/or longer horizons. As time passes and the payoff period becomes closer, the price of the investment moves continuously upward. The analogy can be made to that of a forest, which is growing at a rate in excess of the financial rate, will not be harvested for fifty years. One may buy the forest at a current price given the knowledge that there will be other buyers in the interim willing to buy and hold at all intervals before the harvest.

7. VALUING A DIVIDEND PAYING GROWTH STOCK

A growth company may present the investor with a stream of dividends and earnings growing in excess of the normal yield rate. A solution of the problem is presented for the fictional Shoreham Corporation. In evaluating Shoreham shares, it is necessary to obtain the present value of both the stream of cash dividends and the present value of the future price of the stock.

Illustration of the Valuation of a Dividend Paying Growth Stock – Shoreham Inc.

A. Data:
   Current Earnings = \$5.00
   Current Dividend = \$2.00
B. Assumptions:
   1. Earnings per share will grow at the rate of 20.0% per annum.
   2. The risk adjusted desired rate of return is 10% per annum.
   3. The expected growth period, n, is 10 years.
   4. At the end of 10 years, Crampton shares will have a "normal valuation" at a p/e of 11 times current earnings.
   5. Dividends will be 40% of annual earnings during the growth period and will necessarily grow at 20% per annum.
C. The basic valuation equation is:

$$PV = \frac{D(1+g)}{(1+i)} + \ \dots \ + \frac{D(1+g)^{10}}{(1+i)^{10}} + \frac{11 \text{ x } (E)(1+g)^{10}}{(1+i)^{n}}$$

or the value of the increasing dividend stream for ten years, plus the present value of the price of the shares at the end of the super growth period ten years from date.

D. 1. The value of the dividends is the value of an annuity: $s_{\overline{n|}}^{e}$ where e equals g-i, (20%-10%) or 10.0%, and n = 10 years.

Thus: $S_{\overline{10|}}^{10\%}$	=	15.937
	x	\$2.00
The PV of the Dividends	≈	\$31.87

2. The value of the future share price is obtained by multiplying the future earnings by 11 and bringing this price back to present value.

Future earnings equal $E(1+g)^n$ or $\$5(1.20)^{10}$

$(1.20)^{10}$	=	6.192
	x	\$5.00
The amount of future earning	=	\$30.96

Times the future P/E factor	x	11
The future price of the shares	≈	$340.56
Discounted at the present value factor of $1/(1.10)^{10}$	x	.3855
The present value of the future price of the shares	=	$131.29

The current value of Crampton Shares equals the pv of the dividends plus the pv of the future price of the shares

pv of dividends		$ 31.87
pv of future price		131.29
Current value	=	$163.16

E. Note that on the basis of the current value, the P/E ratio, $163.26/$5 = 32.7

Or earnings to price $5/163.26 = 3.06%

The current dividend yield, $2/163.26 = 1.2%

The growth stock has a high current price-to-earnings multiple and low current yield.

8. SUPER-GROWTH CANNOT BE INFINITE

An investment that forecasts earnings growth for an infinite period in excess of the market's normal rate of return would have an infinite value.[10] However, in actuality, a super-growth period cannot be infinite, and therefore a growth investment has a defined value.

Three constraining factors prevent the growth period from running for an indefinite length. First, it is apparent that no option can keep generating a return that grows forever at a rate that exceeds the growth rate of the economy. A super-growth enterprise that grows at a rate exceeding that of the GDP (Gross Domestic Product) becomes a larger and larger part of the GDP; it becomes a bigger and bigger proportion of the total economy. Taking this proposition to the logical extreme, when the super-growth enterprise becomes the total GDP, it cannot grow faster than the GDP. More realistically, we may note that as the enterprise becomes a larger part of the economy, its rate of growth is constrained by the limits of the system in which it operates.

The second limiting factor involves the relation of the level of the interest rate to available super-growth projects. Theoretically a super-growth investment of infinite duration has an infinite value. However if there were a prevalence of super-growth options, the demand for capital would take a quantum leap. But savings, the supply of capital, is not infinitely elastic. Presumably in any society, people must consume some resources, eat, clothe themselves, and find shelter. They cannot save all income. The price for savings, i.e. the interest rate, must rise, and equilibrium is reached when the interest rate became higher than the rate of growth. Last, we may take a look at the actual financial side of a super-growth process. Presumably, a super growth situation requires an increase in net capital per period which is in excess of the investment in the previous period and which requires that in each period the return on the total capital continues at a rate in excess of the cost of capital. Although given some initial superior advantage in technology or product, an enterprise might enjoy super-growth for a considerable number of years; such growth is not likely to go on indefinitely on an increasing capital base. When in the particular situation, the enterprise begins to evidence a declining marginal return to capital, the period of super-growth must begin to slow and halt.

9. THE PARADOX OF THE LOW CURRENT RETURN ON GROWTH OPTIONS

The existing current return on a growth stock appears meager on the basis of market valuation. Relative to the price, current earnings are very low.[11] The explanation is that the discounting of a projected rising stream of return at a normal desired market rate of return produces a very high present value. It is not that the existing earnings are low, but the high current price that makes them seem so.

Would purchasers of the shares at the current high price lose return if they do not hold the stock to the end of the growth period? Not so. The current earnings yield is low, but the price of the stock over time will rise toward its future price, resulting in capital gains over each holding period.

The periodic capital gains yields the normal rate of return. If actual events, expectations, and market discount rates do not change, every owner for every holding period will obtain the same overall rate of return.

10. RISK AND RETURNS TO GROWTH INVESTMENTS

The volatility of the market price growth stock shares is higher than that for standard shares. Not only must an estimate of the rate of growth be used in the evaluation, but the number of years of forecasted growth, n, is a strategic variable. The market price is highly sensitive to n, and a change in the forecast number of the remaining years of super-growth can bring about wide swings in the price of the shares. Investors who come in early, before the market recognizes the facts of potential growth, may do very well indeed. Even later investors may garner well above a normal return if, after a period, the forecast of the growth period inherent in the price of the shares is extended. On the other hand, if the expected length of the growth period is shortened, the price will drop sharply.

A bit of analytical advice to potential purchasers of growth shares goes as follows. Given the current market price of the shares, and given an estimate of the percentage rate of growth and a reasonable risk-adjusted desired rate of return (discount rate), the number of years of growth necessary to justify the investment will fall out of the equation. If the number of years of sustained growth implicit in the current market price seems reasonable, the investment may be worthwhile. If the required years of growth seem too long, the investment is dangerous.

11. THE COST OF CAPITAL TO A GROWTH FIRM

Because the P/E ratio on a growth share can go very high, some analysts have argued that the cost of capital to a growth company is very low and that, for example in the Shoreham case, the company could invest in projects that at the margin yielded a return on equity of a mere 3.06 percent. This is preposterous. The marginal investment would not cover the normal cost of capital. If this strategy were followed, the market would soon note that the relative returns generated by the company were falling and the Shoreham share price would plunge downward.

The cost of capital to a growth firm is the same as that for normal enterprises in its class. Real capital investments at the margin must yield the norm of the market rate of return. However, the returns made on the intramarginal projects of the growth company are well above the normal rate, so that the **average rate of return** is significantly above the cutoff point. This excess rate of return is sustained because increases in product demand and/or decreases in production costs are continuous over the length of the growth period.

The value of a growth stock is raised by factors outside the financial system. The rise in the value of the stock does not lower the cost of capital.

12. THE COST OF COMMON STOCK FINANCING: THE NORM

Assuming the firm is operating in the range of an acceptable financial structure, the cost of common equity capital is the "normal" earnings yield for shares of the given industry. The earnings yield is the inverse of the price/earnings ratio corrected for projected growth or decline. A stock with average earnings of $4, an estimated growth rate of 3.0% and a "normal" price of $60 has a P/E ratio of 15 and a current yield of 6 per cent. Given the projected growth rate, the minimum rate of return after taxes that the company must make on new equity capital is 9.0%. Investing new equity funds in projects earning less than 9.0% lowers the return for both new and old shareholders. In a growth situation, where the investors believe earnings are likely to increase for some indefinite period, the ratio of current earnings may be very low. Here the cost of common stock financing must be imputed from some normal concept.[12]

The cost of any one source of financing cannot be determined singly. Its interactions with other types of financing must be considered. An increase in equity capital decreases the firm's financial risk and thus lowers the costs of all sources of funds. On the other hand, equity in itself is the most expensive source of funds. Determining the best position between the reduction of risk and the cost of equity funds is the crux of the problem of reaching the "optimum" financial structure. The cost of capital to the firm is the weighted sum of the costs of each source of funds in the optimum mix.[13] However, the basic rule is that unless it is extremely desirable to reduce financial risk, new equity financing should not be used if the effect is to lower the expected earnings per share.

The management must consider financial risk and the cost of funds if it is to succeed in its basic obligation of maximizing the long-run economic position of the common shareholders. The management must not overuse debt financing. Maximizing short-run earnings is not optimum if the shareholders are subject to inordinate financial risk. In making investment decisions, the firm must consider the alternate returns that stockholders could get on their funds elsewhere. The costs of financing new assets must not exceed the projected return on these assets, and neither should the shareholders be subjected to undue risks. These considerations apply to those decisions involving the management of assets and financial decisions, which are under the control of the management. A decline in the value of shares because of unfavorable developments in the general external economy cannot be blamed on management.

13. PREFERRED STOCK

Preferred stock is a form of equity or ownership capital. Its claims to a return out of earnings or to a share of the assets in case of liquidation, comes after the creditors but before those of the common shares. From the viewpoint of the common shareholder, the preferred stock issue performs a function resembling a form of debt-albeit a debt subordinated to the rest of the liabilities. However, the preferred has one basic equity feature: its dividend is not an inflexible claim; it can be postponed or passed without the firm having committed an act of bankruptcy. The equity nature of the preferred shares is recognized in the current corporation income tax law; preferred dividends are not deducted before calculating net income for tax purposes.

13.1 Features of Preferred Stock

Priority on a Stated Dividend The dividend on a preferred is stated on a fixed basis. The dividends on preferred stocks must be paid before any dividends on common can be paid. A corporation has to be in a rather tight financial position before it passes the preferred dividend. The fixity of the preferred stock dividend eliminates any significant gain for the ordinary run of preferred stock from an increase in the prosperity and earnings of the corporation but sets a basic value in the ordinary run of affairs.

A preferred stock has the features of a perpetual annuity. The market price is obtained by dividing the stated dividend by the going rate of return. Thus if the market rate of return on a $5 dividend preferred is 6.0% per cent, the stock sells at approximately $83.33. The market price rises or falls with the level of the interest rate.

Cumulative Dividends Most preferred shares have a cumulative dividend feature. If dividends are passed, they accumulate, and no dividends can be paid on common stock until all arrearages are paid up. The cumulative features deter management from passing the preferred dividend.

A preferred stock carrying passed dividends may sell below par as long as the possibility of the arrearages being paid appears remote. If the economic position of a firm takes a turn for the better and payments of some amounts of the passed dividends are imminent, the price of the preferred stock will rise to somewhere between its long-run investment value plus a discounted value of the accrued past dividends.

Preference to Assets Preferred stock has a priority over the common in case of liquidation. In case of dissolution, the funds from the sale of the assets go first to the creditors and then to the preferred shareholders, and only then is any remainder distributed to the common stockholders. If the funds are insufficient to pay the liquidation value of the preferred stock, the common shares receive nothing. However in involuntary liquidation, through failure or bankruptcy, most of the creditors are probably not paid in full, and both the preferred and the common stock are worthless.

The preferred stock generally has two values: one for "voluntary" liquidation and one for "involuntary" liquidation. Liquidation is involuntary in the case of bankruptcy. The involuntary liquidation value of the preferred generally consists of the par value of the preferred shares plus any accumulated dividends. Voluntary liquidation occurs when the stockholders themselves vote to go out of business. Usually the voluntary liquidation value of the preferred has a premium over par (e.g., a $100 par preferred may have a voluntary liquidation value of $120).

Most companies attach a call option on a preferred issue. This enables the company to buy back (i.e., call) its preferred stock from the holders at a fixed maximum price. The call price is usually set at a premium over par. The voluntary liquidation price and the call price are usually the same.

Nonvoting The preferred shares are generally nonvoting on ordinary matters of corporate policy, but usually have voting rights on matters directly affecting their own position. Many preferred stocks are given the full right to vote on corporation matters if preferred dividends have been passed.

14. RATIONALE FOR PREFERRED STOCK FINANCING

If the going dividend yield on preferred is 6 per cent and the tax rate is 35 per cent, the pre-tax cost of preferred stock financing is 9.23 per cent. The cost of preferred stock financing is relatively high compared to that of tax sheltered debt. On the other hand, as a subordinated form of financing – bearing some of the risks of equity – it helps to support the debt structure. Thus if the firm can net 10 per cent on its equity capital after interest and taxes (about 15.4 per cent before a 35% tax) , an issue of a 6 per cent preferred can be to the advantage of the common shareholders. The 4 per cent earned over the preferred dividend becomes part of the return of the common shareholders. *The preferred is a form of leverage within the equity section of the financial structure.* Nevertheless, the corporate income tax makes preferred stock financing expensive compared to debt. At present, preferred stock is not very common on the new issue market.

15. CONVERTIBLE PREFERRED

A number of preferred issues have a convertible feature. At the option of the holder, the preferred shares may be turned in for common stock at an agreed ratio or price.[14] The conversion option may be open indefinitely or it may expire after a stated date.

Charter provisions and indentures are generally drawn up to protect the holder of a convertible security against dilution of the value of the convertible privilege. The conversion ratio is adjusted for any common stock splits or dividends. For example, a conversion ratio of 2 for 1 will be raised to 4 for 1 if the common shares are split 2 for 1.

Rationale of Convertible Preferred. The logic of issuing convertible preferred rests on the possibility of the firm obtaining, for the time being, equity funds at a lower cost than that desired on the common equity. The conversion feature induces investors to supply the firm with equity capital at a reasonable rate. The convertible feature gives the purchasers the advantages of a hedged bet; they have some of the safety of return given by the preference feature of the shares, and the conversion feature allows them to share in the gains if the earnings and market value of the common shares rises.

Convertible preferred shares are sometimes used to make merger terms more attractive. The stockholders of the firm being wooed into the merger are given convertible preferred shares of the acquiring firm in return for the common stockholdings in their present company. The new group of stockholders has some protection against a decline in the fortunes of the acquiring company plus a chance to share in its possible success.

The advantages to one side on a convertible issue are of some disadvantage to the other. If the enterprise is successful, the potential gain to the common is diluted as the preferred shareholders turn their shares into common. The rise in common share earnings is delayed, and there is a drag on the market price of the common until all the preferred is converted. On the other hand, the initial flotation of the converted preferred gives the firm equity funds relatively cheaply, and in the interim before conversion, the amount earned on these funds over and above the preferred dividend benefits the common shareholders. Perhaps the increased equity funds acquired at a strategic time enable the corporation to obtain additional debt funds at better terms, and, of course, the common stockholders benefit from all returns in excess of the cost of the financing mix. Thus the decision to float a convertible issue rests on a favorable weighing of present benefits against a potential future detriment.

Effects of Conversion Features on the Market Price. The convertible feature on a security is an option to buy the common stock at a fixed price, and the option fetches a price in the market. The more optimistic the market, the higher the price of the option. The amount at which the market prices the option can be inferred from the difference between the market price of the preferred and its pure investment or the value, where the investment value is the price the stock would sell for as a pure preferred stock and the conversion value is the amount the preferred is worth if turned into common stock at the going price.

Table 2 gives some examples of possible relationships between these various prices. The preferred illustrated in Table 2 has a dividend of \$5.50 annually and a conversion rate of 2 for 1 on the common. If the normal yield for a straight preferred stock were 5.5% per cent, the stock would have an investment value of \$100. In example 1 in Table 2, the conversion value of the preferred is \$80, but the market will pay \$110 for the preferred; the option price is \$10. However, not only is the \$10 option premium at risk if the common should fall significantly, but in the interim, the conversion option price reduces the current yield on the preferred from 5 ½ per cent to 5 per cent. The price of the preferred in example 2, illustrates an optimistic market. The premium for the convertible option is \$10 over the conversion price; a current purchaser of the preferred could not convert except at a loss. Although the option price is still only $10, the amount out at risk over the investment value is $30 per share and the current yield is down to 4.23 per cent. In example 3 the conversion value of the preferred is $160, but the option premium has dropped to $2. In a rational market, the conversion option price goes down if the conversion value rises high enough. A purchaser of the preferred would have $62 at risk. He no longer has any significant comparative safety as against a direct investment in the common. Moreover, the yield on the current price of the preferred is now only 3.4 per cent. In short, as the conversion value rises, the advantage of the hedged position diminishes.

Call Prices and Forced Conversion If the convertible preferred has a call feature, the firm may force conversion by calling in the preferred. If, for example, the preferred is convertible to common 1 for 1, the market price of the common is $70, and the call price of the preferred is $60, an investor has no choice but to change his preferred into common if the preferred is called.

Table 2. Possible Market Prices on a $5.50 Dividend Convertible Preferred Stock (convertible into common at a rate of 2 for 1) (assume a normal preferred stock yield of 5 ½ percent)

	Market Price Common	Investment Value Preferred	Conversion Value Preferred	Market Price Preferred	Premium for Conversion Option
1. Preferred has no positive conversion value	$40	$100	$80	$110	$10
2. Preferred has a slight positive conversion value	60	100	120	130	10
3. Preferred has a considerable conversion value	80	100	160	162	2

The reasons for a forced conversion vary. The preferred may have a restrictive covenant – such as limitation on bank borrowing or senior debt – which put difficulties in the way of new financing. Or the company might wish to simplify its capital structure preliminary to raising funds on a new security issue. There does not seem to be any obvious economic gain in forcing conversion, for if the common has risen so high as to make this operation possible, then the return on the common must be quite good, and the risk in carrying the preferred cannot be very large.

16. PROTECTIVE FEATURES ON PREFERRED SHARES

The indentures on preferred issues may carry features designed to give additional protection to the preferred stockholders. These provisions are similar to the protective clauses found on debt issues. There may be provisions relating to the maintenance of minimum working capital ratios before common stock dividends can be paid. There may be limitations on the amount of debt the firm may carry. Minimum working capital ratios and financial structure ratios may be required before additional senior debt can be incurred.

A preferred issue may have a sinking fund provision. The sinking fund is used to retire some fixed portion of the preferred stock annually. By reducing the amount of the preferred stock outstanding in a systematic manner, the position of remaining shares is strengthened. The sinking fund provision usually allows the firm to buy the required amount of preferred shares either at the market price or at a predetermined sinking fund call price.[15]

17. FLOATING NEW COMMON EQUITY ISSUES

Very seldom does an on-going, mature company issue major amounts of additional capital stock. Usually any increase in equity capital is provided by retained earnings. New equity may be required in a new company when the inflow of retained earnings does not provide a sufficient equity base to finance the growth of the firm. Or firm may issue new equity when special investment opportunity opens up, or the firm wishes to finance the acquisition of another company. The firm could finance the expansion solely with debt, but if the proportion of debt to equity grows too large, the firm's financial risk increases. Thus a large package of new debt finance often includes an accompanying stock issue.

Rights. As a matter of precaution, to make sure the flotation is successful, the announced price on a new issue of shares is usually set below the market price of the existing stock. To compensate the old shareholders for the potential dilution in the value of their holdings, they are given rights, i.e. options to purchase the new issue at the discounted market price. A market develops for the rights, and the existing share-holders may exercise the rights to purchase additional shares or sell the rights on the market.[16] In either case they are compensated for allowing in new shares at a reduced price. In case where there are major shareholders who exercise some degree of control, exercise of the rights allows them to maintain their proportional share of the voting common.

18. ADVANTAGE OF NEW SHARE FINANCING

The main advantage of new capital stock financing is that the shares require no fixed rate of return and there is no maturity date on the principle. Although the new shareholders will share equally with existing shareholders in the company's success, they do not constitute a legal liability if the company does not do as well as expected. If the firm experiences temporary economic setbacks, it need not pay anything to the shareholders until conditions improve. For a new firm, which may suffer operating losses before establishing a profitable level of operations, a heavy equity base if obtainable increasing the chance of surviving the lean times.

If the corporation is to justify new common stock financing, it must earn the going rate of return on equity on the new issue. If it does not reach this rate of return, the value of its present stockholders will be drawn down. However, additional equity financing reduces internal risk, lowers the cost of additional debt financing, and may reduce the overall cost of funds.

Notes

[1]See Chelcie C. Bosland, *The Common Stock Theory of Investment*, Ronald Press, 1937.

[2]Price/earnings ratios are given as multipliers. They are the number of times the going market price of the stock exceeds annual earnings per share. The price/earnings ratio equals $\frac{\text{market price}}{\text{annual earnings}}$. Current dividend yield, on the other hand, is obtained by dividing annual dividends by the market price. It is therefore stated as a percentage. No special reason can be adduced as to why these two relationships are customarily presented in these different manners. It does, however, help to prevent unnecessary confusion on the security markets.

[3]See E. Schwartz and R.J. Aronson, "The Corporate Sector: A Net Exporter of Funds," *Southern Economic Journal*, October 1966.

[4]Thus if a stock had annual earnings of \$6 and sold for \$60, its p/e was ten times; if earnings should drop to \$5 and the stock price drops to \$55, still the p/e ratio would have risen to eleven times.

[5]For the basic statement of this concept, see Graham Dodd, *Security Analysis*, McGraw-Hill, 1951, pp: 410-11.

[6]In rather old-fashioned parlance a stock dividend was described as "capitalizing earnings."

[7]One of the authors used Dominion Resources as an example of security valuation for an Advanced Financial Management class at Rutgers University in October 2001. Dominion Resources has outperformed the market, the S&P 500, by approximately 3 percent over almost 3 years; the relative out-performance reaching 15 percent in October 2003. One might smirk at such a return; however, one must remember that the beta of Dominion Resources is approximately 0.20, creating a more reasonable market-adjusted excess return. Dominion Resources has cumulatively under-performed the market in one month of the 36 months (which one of my former Penn students noticed with an interesting E-mail).

[8]On August 10, 2006, a final version of this chapter was completed. The price of Dominion Resources was $ 78.90. D, with a current beta of 0.44, had out-performed the market (S&P 500 Index) by over 500 basis points during the past two years.

[9]To make calculations easier we have set up an average growth rate. In fact, we are likely to have a curvilinear growth path. This does not vitiate the basic concept.

[10]If the growth rate exceeds the prevailing discount rate and is of unlimited length, the theoretical present value of the investment option is infinite. This result at the extreme has led to much philosophical discussion in a variant form of the "St. Petersburg Paradox" as to whether any value can be infinite.

[11]A similar phenomenon also holds for real estate in a growth area where the current short-term rents appear to be low relative to the market price of the properties.

[12]It may be of interest that Adam Smith wrote that the normal rate of profit on ownership capital would be about double the interest rate on sound commercial loans. A. Smith*, The Wealth of Nations*, Modern Library, E. Cannan, Ed. 1937, Ch. IX, p. 97.

[13]See Chapter 10.

[14]Since a convertible issue, whether preferred stock, debenture, etc., can be turned into common stock, possibly changing the future sharing in earnings, assets, and voting strength, preferred subscription privileges (the pre-emptive right) is often given to the common stockholders on the initial flotation of any convertible security.

[15]The sinking fund call price is usually lower than the general call price.

[16]Because the rights need not be exercised immediately and provide an option to buy at a fixed price, they generally develop a speculative premium over their current exercise value. Of course, the rights will go to their net value when the rights expire.

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Problem

1. Given the following data for IBM, is its stock price equilibriumly-valued at $88.04?
   Beta = 1.45
   Risk-free rate is 1.87%
   Market-Risk premium = 8.8%
   Dividends (last year) = $0.63
   EPS, 2003 = $4.34
   EPS, 1994 = $1.23

Chapter 9

LONG-TERM DEBT

Long-term debt is the term given to those obligations the firm does not have to pay for at least a year. They are also called funded debt or fixed liabilities. Items that may be classed as long-term debt are bonds, debentures, term loans, or, in small firms, mortgages on buildings. The portion of the long-term debt due within the current year is carried in the current liability section of the balance sheet. Firms in the US issue far more debt than equity shares. In most years during the 1963-2003 period, firms have issued 6-8 times more debt than equity. (Of course most increase in equity is through retained earnings.) Issuing debt raises capital for firm growth and expansion without possibly lessening current stockholder control. The floatation costs are less on debt than on equity, and the cost of debt is less than the expected shareholder return on equity.

1. BONDS

A bond is a formal long-term promissory note. It is a promise made by the company to pay a fixed sum of money at a determinable future date with a stipulated interest rate. A bond issue is composed of a number of notes, which may be owned by different holders. Since bonds are negotiable instruments, they are readily transferred from one investor to another and bona-fide holders for value are given the usual protections of the negotiable instrument laws against counterclaims.

The major provisions of a bond issue are listed in the bond indenture. This legal document describes the agreements and pledges made between the corporation and the bondholders (creditors). The indenture is usually quite long, and it is impractical to attach a copy to each bond certificate. Each bond, however, carries a reference to the indenture, and the bond owner is presumed to have access to the indenture; at least he can learn of its major features in the original prospectus, written up at the initial issue of the security.

Because in most cases it would be impractical for an individual bond owner to enforce his rights under the indenture, and because it would be a matter of some difficulty for the company to deal with each bondholder separately, the actual enforcement of the indenture is left to a trustee.[1] It is the trustee's duty to ensure that the firm lives up to the provisions in the indenture protecting the bondholder. Because Congressional hearings in the 1930's indicated that some trustees had not always been fully vigilant in enforcing the indenture provisions, and even that some trustees had interests in the corporation in conflict with the interests of the bondholders, the Trust Indenture Act was passed in 1940. This law establishes a high standard of conduct for the trustees and prohibits individuals or firms who might have conflicts of interest with the bondholders from acting as trustees on the indenture.

Mortgage Agreement. The usual bond issue is generally backed by a mortgage, basically a lien given to the creditor against some of the firm's assets. This lien gives the creditors a provisional title against the assets which can be exercised if the debtor does not pay his notes as agreed. If the lien is not paid, the mortgaged property may be seized and auctioned off to satisfy the debt. If the property brings more than the mortgage at the sale, the difference goes back to the owner; if the property is not sold for an amount sufficient to satisfy the debt in full, the unpaid portion remains as an obligation of or a general claim against the debtor. The mortgage is given by a company as a protective feature of the indenture to provide additional security for all the owners of the bond issue. A mortgage usually contains a clause requiring minimum maintenance standards on the property, and provides for the compulsory retirement of a proportionate part of the outstanding debt if some part of the underlying property is disposed of.

Many bond mortgages contain an "after-acquired" clause. This clause requires that all new property coming under the ownership of the firm fall under the lien of the existing mortgage. If the indenture is closed, i.e., that is no new debt can be issued under the cover of the existing mortgage, it could mean that on the purchase of new assets the firm could offer prospective new lenders only a second mortgage, i.e., only a subsidiary lien on the new properties. In certain instances these circumstances have put an unfortunate rigidity in the corporation's financial plans. However, in most cases where the mortgage is closed, the lien is restricted to definite property and does not flow over (at least as a prior lien) to other assets.

In most existing bond issues where the after-acquired clause is part of the indenture, the mortgage is conditionally open. Additional debt can be created under the existing mortgage up to 60 per cent, for example, of the amount of new assets acquired by the firm. The corporation thus has considerable flexibility in financing new property without diluting the underlying protection of the old bondholders.

The importance of mortgage provisions to the security of the bondholders has been exaggerated in the past. Earnings and cash flow are more relevant to the safety of the interest payment and the ultimate repayment of the bonds than the pledge of property. The property itself is not likely to have much dollar value unless it can generate earnings; it must show economic usefulness in our competitive society if it is to bring any cash on the market. On the other hand, there has been a recent tendency to deprecate any value to the bondholders in a mortgage provision. But a mortgage claim has considerable worth in the event of ultimate financial disaster. In bankruptcy the mortgage lien and its priority have tremendous importance in determining the amount and value of the securities the bondholders will get if the firm is reorganized, or the amount of cash they will receive in settlement of their claim if the bankrupt firm is liquidated. Because the mortgage pledge is generally placed mainly against fixed assets, it provides additional security to the bondholders even within the "going concern" concept. Because depreciation is a charge against income, but not an out-of-pocket expense, a firm having a considerable amount of depreciable fixed assets has a relatively larger cash flow than a firm with similar earnings but relatively little fixed assets.[2] The inflow of cash is one criterion of a firm's ability to carry debt; a firm with earnings and substantial fixed assets is obviously in a safer position to incur funded debt.

Subordinate Mortgages. Bonds are sometimes secured by a second or third mortgage if a prior mortgage already exists on the property. In case of default, the pledged assets are used first to satisfy the first mortgage holder's claims, and any remaining value goes to the second mortgage. The holders of any part of an unsatisfied mortgage claim become general creditors.

If the prior bond issue is small compared to the total value of the assets pledged, a secondary lien may actually have considerable strength. If a property valued at $1,000,000 carried a first mortgage of $200,000 and a second mortgage of $300,000, the position of the second mortgage bonds might be better than a first mortgage of, let us say, $700,000 on a property of similar value. Bonds backed by a secondary lien, however; are seldom called second mortgage bonds but tend to bear titles like "Improvement Bonds, 1990," "General Consolidated and Refunding Bonds, 1995," etc. Many railroad bond issues have extremely complicated mortgage positions. They may have first mortgage claims over one section of trackage, secondary liens over another, and tertiary claims over still another part of the company's property. These complexities tend to add difficulties to the problem of reorganization in case of failure.

Other Liens. Many bond issues, besides holding mortgages against the firm's fixed assets, may be given a lien against stocks or bonds the borrowing firm carries as investments. (A bond issue backed mainly by a contingent claim against such securities is a collateral trust bond.) The pledge of securities does not always add safety to a bond issue. The stocks and bonds are often those of firms or enterprises whose economic position is closely tied to the borrowing company; if the borrowing corporation falls on hard-times, the issues of satellite companies may not be too valuable.

Net Working Capital Maintenance Requirements. Some indentures require a firm to keep its net working capital above a stipulated proportion of the funded debt. If the firm suffers losses, this proportion may be difficult to maintain. If interest payments and the other indenture provisions are met, however, the trustees often ask the bondholders to relax the working capital requirement temporarily, rather than force failure on the firm. Nevertheless, although working capital maintenance provisions may add little to the debt holder's security in a downturn, in normal periods they warn the management of the dangers of drawing down working capital with excessive dividends or by overinvesting in fixed assets.

Dividend Restrictions. Dividend restrictions help safeguard the bond issue by preserving the debt-to-equity ratio in the firm's financial structure. Usually dividends are restricted to earnings made after the bond issue, perhaps plus some arbitrary amount. Dividends may be limited to a fraction (e.g., two-thirds of all subsequent earnings) or prohibited entirely for a definite period of time. The general effect of these provisions is to keep assets within the firm unless there are operating losses.

Sinking Funds. Most bond indentures provide for a periodic repayment of at least a substantial proportion of the bonds before maturity. The required amount of bonds can be repurchased on the market (at market price) or called in by the use of the sinking fund call option. The call option gives the sinking fund trustees the right to buy back a given portion of bonds at a previously fixed price. The periodic retirement of part of the issue strengthens the position of the remaining outstanding bonds.

Restrictions on Creating New Debt. If a firm incurs new obligetions at too heavy a rate (especially if the new creditors have the same or higher priority than the present creditors), the position of the existing debt holders is eroded. Thus restrictions are generally placed on the amount and types of new issues. Yet the firm must have some flexibility in its financial operations; if restrictions are unreasonable, it may turn to a more liberal competitive source to obtain its funds. Therefore most indentures do not prohibit the firm from borrowing new funds outright, but attempt to set bounds of safety before additional debt can be floated. Most indentures have a number of conditions, all of which must be satisfied simultaneously.

In first mortgage bonds, one likely condition is to permit the issue of new bonds up to some percentage of new fixed assets acquired. New bonds are also allowed to replace any part of the issue which may have been retired outside of the required sinking fund. Other common restrictions require the firm to have met certain minimum interest charge coverages over perhaps the last five years before new fixed debt obligations can be created. Often, especially for industrial firms, net working capital has to bear a given percentage to the total proposed funded debt.

Indentures on junior debt-claims of lower priority-may limit the total bank debt that can be created and restrict the amount and kind of senior debt that the firm may incur.

2. OTHER TYPES OF LONG-TERM DEBT

Debentures: A debenture is a bond unsecured by a lien or mortgage against the firm's assets. It is a general obligation of the corporation and holds the, same position as any other general creditor. A debenture issued after other secured long-term debt is already outstanding is weakened by the priority of claim of the senior issue and has to bear a higher yield in order to find acceptance in the capital markets. Commonly, however, the debentures constitute the sole long-term debt issue of industrial firms; if the company is strong, the debenture's financial position may be quite secure, and the interest rate comparatively low.

A type of debenture that has become quite popular in financing commercial finance companies is the subordinated debenture. A major clause of the indenture provides that the claims of the debenture rank behind those of bank loans the company is carrying or may incur. A subordinated debenture issue adds to the safety of the bankers' loans, since it provides additional risk-bearing funds in the firm's financial structure.[3] It serves the same function as preferred stock. From the view of the company, the subordinated debentures allow the firm to negotiate more bank borrowing without putting new equity capital immediately into the firm. Moreover, the interest paid on the debentures is deductible for tax purposes, whereas the dividends on a preferred stock issue are not.

Term Loans. A company may negotiate a loan with a bank, a group of banks, or an insurance company that may last from one to perhaps 15 years, usually 3 to 10 years. These loans, amortized periodically, are designated term loans; whereas the ordinary commercial loan is hardly ever made for more than 90 to 120 days. The term loan is often used to help finance the purchase of equipment and is customarily secured by a chattel mortgage[4] against new machinery, trucks, etc. They were quite popular in the immediate postwar period, when banks were diligently seeking additional ways to put their funds to work. The development of the term loan has provided the medium-sized business with one source of comparatively available, reasonably priced intermediate term funds.

Private Placements. When a company sells or "places" all of a given issue to a single buyer, e.g., an insurance company, a large bank, or a group of insurance companies or banks, rather than sell its securities to the investors at large in the capital market, the transaction is called a private placement.

Equipment Trust Certificates. The equipment trust certificate has been used for some time in financing railroad rolling stock (freight and passenger cars, and locomotives) and now appears in the financing of airline equipment. The basic legal provision of the equipment trust certificates indenture, leaves the legal title to the newly purchased aircraft in the possession of the trustee on the issue. The trustee (usually a bank) leases the equipment to the airline. The railroad company puts up about 20 per cent of the cost of the new airplanes and agrees to pay an annual or semiannual rent sufficient to cover the interest on the outstanding trust certificates and retire the principal of the certificates, usually in fifteen years. The certificates, which have been floated to obtain the money for the equipment, are issued in series so that some part comes due every year; when the last issue is retired (that is, when the last rental payment is made), the airline exercises its option to buy, and the title to the planes is released to the air line.

The holders of equipment trust certificates are not legally creditors of the corporation but participants in a leasing agreement. Legally their position is that of beneficial owners (through a trust arrangement) of an identifiable lot of aircraft. This actually makes their credit position quite strong. Should the airline fail to meet its rental payments (i.e., the principal and interest due on the certificates), the trustee on behalf of the certificate holders can take possession of the planes and sell them to another line. There have been very few cases of default on equipment trust certificates; even in case of bankruptcy and reorganization, the trustee in bankruptcy will keep up the rental payments rather than lose the use of the aircraft, without which the operation of the airline becomes impossible. Equipment trust certificates tend to bear comparatively low interest rates, Because of their rather special position, which gives them considerable safety.

3. LONG-TERM LEASE

Some firms acquire fixed assets by renting them rather than purchasing and financing them. The lessee (user) makes periodic payments, monthly, quarterly, or semiannual, payments, to the lessor (owner) for the exclusive rights to use the asset. A long-term lease lasts from ten to twenty years. One form of long-term lease is the sale-and-lease-back. A firm sells a building or plant to another company, sometimes a subsidiary or more frequently an insurance company, to obtain immediate funds. It then commits itself to renting the property on a long-term basis. Typically lease payments are made in advance. Leases may be operating, or financial. An operating lease is a short-term obligation, usually for a period less than the economic life of the asset, and is cancelable. Financial leases are longer-termed obligations, approximating the economic life of the asset, and are non-cancelable. Sale-and-lease-back arrangements usually allow for repurchase at a .fixed price after the rental term is over.

Traditionally leases were not disclosed, and were referred to as "off balance sheet" financing. Financial Accounting Standards Board (FASB) Statement No. 13, adopted in 1981, requires capitalization on the balance sheet of leases, known as capital leases, meeting any of the following criteria:

1. The lease transfers title to the lessee by the end of the lease period.
2. The lease contains an option to purchase the asset at a bargain price.
3. The lease period is equal to or exceeds 75 percent of the economic life of the asset.
4. The present value of the minimum lease payments is equal to exceeds 90 percent of the fair value of the leased property, at the beginning of the lease.

The absence of all four conditions creates an operating lease than is cancelable and not capitalized. The capitalized value of a capital lease is the present value of the minimum lease payments over the lease period. The discount rate used to determine the present value of the lease payments is the lessee's cost of borrowing or the lessor's implicit interest rate. Operating leases can be disclosed in financial footnotes. Five years of non-cancelable operating leases must be disclosed, annually, as well as the total future minimum lease payments.[5]

A capital lease must be amortized over the lease payment. The lease is amortized as the firm depreciates its assets, and the annual interest implied in the lease payment is treated as an expense. The interest expense reduces net income. In an operating lease, only the lease payment itself is deductible as an expense.

Logically, it would seem that long-term leasing or outright purchase of an asset should be considered alternative forms of financing. Renting requires little immediate outlay of funds, but the future cash flow from the project is reduced by the rental payments. The rental payments must contain all sorts of implicit capital costs, since the owner of the asset will expect to earn a fair return on his funds. Obviously the implicit interest rate on a long-term lease will be higher than the cost of "loan" capital to the firm. Whether renting or purchasing assets is better (for those firms which have easy access to the capital markets) depends upon which method shows a higher rate of return.[6] If no special hindering factors exist, purchase rather than rental is economically justified if the firm can make a going rate of return on the extra funds put into the purchase.

Rental saves the firm from the eventual burden of holding obsolescent equipment. This argument may be true where the rate of technical improvement is rapid, the equipment mobile, and the rental period short. In this case, after the lease is over, the company can obtain new equipment if the old proves unserviceable or better designs are available; however, one must assume that owner of the equipment will require high enough rental payments – on the average – to cover the possibilities of rapid obsolescence. In the usual long-term rental contract on real property , which often runs for twenty or twenty-five years and where the rent payment amortizes the whole cost of the property over this period, potential losses from obsolescence or changes in the economic value of the location can hardly be shifted from the renter to the owner. As a matter of fact, if the property declines in use value a renter may be in a more difficult position because he finds it harder to adapt the property to new uses than would an owner.

Renting saves taxes. The rental payments in capital leases include both a charge for interest on the funds invested in the property plus the amortization or repayment of the principal amount of these funds. The whole of the rent is deductible for tax purposes; on a bond issue only the interest is a deductible expense and repayment of the principal is not. This argument oversimplifies the problem of taxes, however, for if the property is owned by the firm depreciation charges may be deducted before calculating taxable income. The tax advantages, if any, can be found by calculating the rate of return under ownership or rental using the net cash flow after taxes. In many cases the rental program offers no net tax savings.

A post-inflationary situation can encourage sale-and-lease-back arrangements for the tax advantage. At the end of the period many companies may have assets of considerable market value which have been written off on the corporation's books so that no more depreciation charges are allowable. The possibilities of a sale-and-lease-back arrangement for tax savings now arises. The firm sells its property to an insurance company (sometimes to its own special real estate subsidiary) and agrees to rent the property back at a rate which would cover the going interest rate plus repayment of the value of the property. The firm pays, out of the receipts for the sale of the property, the capital gains tax on the profits of the sale, but it saves out of future taxes on income the amortization on the principal value.[7]

In general, the sale-and-lease-back arrangement is worthwhile if the present value of the savings to be obtained out of future taxes exceeds the amount of the immediate capital gains tax. In a bankruptcy, the lessor's position may be better than a traditional creditor, as the lessor owns the asset and can retrieve it upon the lessee default.

4. THE COST OF DEBT CAPITAL

The explicit cost of a long-term debt issue is the interest rate the firm pays on the net funds obtained by the bond issue. But there are costs other than the explicit interest rate which a firm must consider before floating a debt issue. Debt increases the financial risk of the firm and thus raises the cost of equity capital. Further, every additional amount of debt has its effect on the interest rate that the firm will eventually have to pay on its overall debt, and thus may have a marginal cost measurably higher than the actual rate at which the bonds are floated.

A firm also incurs intangible "managerial" costs on a bond or debt issue. It must meet cash drains periodically as the issue is amortized, and the indenture on the bond issue usually carries restrictive clauses that may at some time hamper managerial freedom or flexibility.

Of course some of the problems and costs of incurring long-term debt exist with other types of debt financing. For example, a firm may have the choice of using more short-term debt (economizing on net working capital) or using additional long-term debt. Long-term debt may have a higher explicit interest cost, but heavy short-term debt brings with it more implicit costs and difficulties. If open-book creditors are not paid on time, the costs of lost cash discounts can come to an astounding rate.[8] Heavy short-term debt may force the firm to forego immediately profitable buying opportunities or hurriedly to arrange financing at inopportune times. Nor is the notion that short-term debt is passable but fixed debt is risky or dangerous a valid one. Long-term debt has its risks, but trying continually to balance and meet current indebtedness is riskier. If current debt is defined as those obligations due within the year, it is a truism that a firm fails by being unable to meet current obligations, not by being unable to meet its funded debt.

The intangible costs of all debt issues are extremely important; however, the going interest rate (the explicit cost) is an index of certain aspects of these intangible costs. Furthermore, the interest rate is an observable, measurable phenomenon, whereas the implicit costs are not.

The interest rate a firm has to pay on any debt issue is conditioned by four major factors: (1) the basic level of prevailing market interest rates; (2) the length to maturity of the issue; (3) the particular type of issue, its provisions, and its security position relative to other financing the firm is already carrying or may incur; (4) the general credit standing of the firm.

How can one measure the credit quality of a firm or a firm's particular issue? The marketplace relies upon several bond rating services to assess risk. Mergent's and Standard and Poor's have long histories of rating debt. Standard and Poor's Corporation uses the following debt ratings:

Rating	Financial Strength or Condition
AAA	Extremely strong to repay debt and interest
AA	Strong capacity to repay principal and interest
A	Strong capacity to serve debt, but more volatile than AA debt
BBB	Adequate debt-serving capacity, but more volatile than A debt
BB	Bonds have long-term uncertainty, but adequate short-term debt-serving capacity
B	Larger volatility than BB Bonds
CCC	Current vulnerability to default, and dependent on favorable economic conditions to service debt
CC	Debt subordinated to CCC senior debt
C	Same as CC
D	Debt is in default

All these factors are significant, although some of them may be objectively determined and others are subjective. Standard & Poor's uses the following criteria to partially determine debt ratings:

ADJUSTED KEY INDUSTRIAL FINANCIAL RATIOS

U.S. Industrial long term debt Three-year (1998 to 2000) medians	AAA	AA	A	BBB	BB	B	CCC
EBIT int. cov. (x)	21.4	10.1	6.1	3.7	2.1	0.8	0.1
EBITDA int. cov. (x)	26.5	12.9	9.1	5.8	3.4	1.8	1.3
Free oper. cash flow/total debt (%)	84.2	25.2	15.0	8.5	2.6	(3.2)	(12.9)
FFO/total debt (%)	128.8	55.4	43.2	30.8	18.8	7.8	1.6
Return on capital (%)	34.9	21.7	19.4	13.6	11.6	6.6	1.0
Operating income/sales (%)	27.0	22.1	18.6	15.4	15.9	11.9	11.9
Long-term debt/capital (%)	13.3	28.2	33.9	42.5	57.2	69.7	68.8
Total debt/capital (incl. STD) (%)	22.9	37.7	42.5	48.2	62.6	74.8	87.7
Companies	8	29	136	218	273	281	22

Data for earlier years and in greater detail are available by subscribing to Standard & Poor's CreditStats.

Source:www.standardandpoors.com

The general level and time structure of the interest rate can be determined by ascertaining the going market yield on various bonds currently traded. The market yield-which is the important quantity-is not the same as the coupon or stated interest rate of the bond. The true yield on a bond is obtained by considering (1) the contractual or stated rate on the bond, (2) the remaining life to maturity of the bond, and (3) the current market price of the bond. The purchasers or investors in a bond obtain two items of value: they are to receive the face or par value of the bond at maturity, and they are to receive the stated interest rate annually or semi-annually over the life of the instrument. The price they pay is the present value of these two features; the yield they obtain is that rate which equates the present value of the two items with the going market price. This is represented by the following equation:

$$\text{Market Price} = \frac{\$I}{(1+i)} + \frac{\$I}{(1+i)^2} + \frac{\$I}{(1+i)^3} + \cdots + \frac{FV}{(1+\mathrm{i})^n}$$

$I is the (annual) interest paid, FV equals the face value of the bond to be paid at maturity, n is the number of years to maturity, and i is the unknown yield. Although the formula appears complex, it is not difficult to use. Furthermore, every investment house, knowledgeable investor, or broker has a computer program table that quickly reveals the yield if the market price is known, or gives the price which should be paid if the buyer wishes to stipulate the yield.

Bond Prices on the Market. Since the maturity date and the coupon or stated interest rate are fixed at the time of the initial flotation, the market price of the bond moves in response to the changing level of the interest rate on the market. If the current market interest rate is higher than the fixed rate on a bond, the bond sells below par value or at a discount. If the going interest rate is below the coupon rate, the bond sells at a premium. The general bond market moves inversely to the interest rate; when the rate is falling, bond prices move upwards, and when the yield rate is rising bond prices drop. A "strong" market signifies a lowering of interest rates and a "weak" market means the opposite.

The general level of interest rates is determined by the supply and demand for investment funds on the capital and money markets. The bond market, however, is not the model of a perfectly free market because the interest rate is influenced by government monetary and fiscal policy as implemented by the Federal Reserve System and the Treasury. The bond market is also a speculative market; the market interest rate is influenced by forecasts or expectations as to the future level of the interest rate.

Supplying the capital funds market are the net purchasers of bonds – insurance companies, investment companies, banks, trust funds, pension funds, and individual investors. The demand for funds comes from the net issuers of bonds – state and municipal governments, the federal government and its agencies, foreign governments, international agencies, and private corporations. The market can be analyzed in terms of the supply and demand for funds, or in terms of the supply and demand for securities. When the demand for funds increases at a faster rate than supply, the demanders of funds (borrowers of capital) have to pay higher interest rates. Or, conversely, if the supply of bonds on the market increases relative to the demand for debt securities, bond prices fall, i.e., the interest rate rises. Of course, the opposite of these statements holds, and during a period of easy money, when the supply of funds seeking investment is relatively greater than the demand for capital, the interest rate falls and bond prices rise.

5. LEVEL AND STRUCTURE OF THE INTEREST RATES

Table 1 presents average interest rates prevailing on high-grade securities for the 1960-2003 period. Interest rates, on even the best securities, show considerable movement. Treasury bonds are considered the safest of all investments and therefore their interest rate is lower than other bonds of comparative maturity and tax status. The yield curve shows the relationship between the time to maturity and the yield to maturity, for a given issuer (or risk of issuer). That is, as time to maturity increases, what happens to the yield to maturity of debt? From the view of default risk, it is usually felt that short-term issues (of equal quality) are safer, from the investor's point of view, than long-term issues.

Table 1. Bond Yields and Interest Rates, 1960-2005 (percent per annum), Selected years

	U.S. Treasury securities					Corporate bonds (Moody's)		High-grade municipal bonds (Standard & Poor's)	New home mortgage yields[4]	Prime rate charged by banks[5]	Federal Reserve	
	Bills (new issues)[1]		Constant maturities[2]									
Year	3-month	6-month	3-year	10-year	30-year	Aaa[3]	Baa				Discount rate	Federal funds rate[7]
1960	2.93	3.25	3.98	4.12	......	4.41	5.19	3.73	......	4.82	3.53	3.22
1965	3.95	4.06	4.22	4.28	......	4.49	4.87	3.27	5.81	4.54	4.04	4.07
1970	6.46	6.56	7.29	7.35	......	8.04	9.11	6.51	8.45	7.91	5.95	7.18
1975	5.84	6.12	7.49	7.99	......	8.83	10.61	6.89	9.00	7.86	6.25	5.82
1980	11.51	11.37	11.55	11.46	11.27	11.94	13.67	8.51	12.66	15.27	11.77	13.36
1985	7.48	7.66	9.64	10.62	10.79	11.37	12.72	9.18	11.55	9.93	7.69	8.10
1990	7.51	7.47	8.26	8.55	8.61	9.32	10.36	7.25	10.05	10.01	6.98	8.10
1995	5.51	5.59	6.25	6.57	6.88	7.59	8.20	5.95	7.87	8.83	5.21	5.83
2000	5.85	5.92	6.22	6.03	5.94	7.62	8.36	5.77	7.52	9.23	5.73	6.24
2001	3.45	3.39	4.09	5.02	5.49	7.08	7.95	5.19	7.00	6.91	3.40	3.88
2002	1.62	1.69	3.10	4.61	......	6.49	7.80	5.05	6.43	4.67	1.17	1.67
2003	1.02	1.06	2.10	4.01	......	5.67	6.77	4.73	5.80	4.12	2.12	1.13
2004	1.38	1.58	2.78	4.27	….	5.63	6.39	4.63	5.77	4.34	2.34	1.35
2005	3.16	3.40	3.93	4.29	….	5.24	6.06	4.29	5.94	6.19	4.19	3.22

[1] Rate on new issues within period; bank-discount basis.

[2] Yields on the more actively traded issues adjusted to constant maturities by the Department of the Treasury. In February 2002, the Department of the Treasury discontinued publication of the 30-year series.

[3] Beginning December 7, 2001, data for corporate Aaa series are industrial bonds only.

[4] Effective rate (in the primary market) on conventional mortgages, reflecting fees and charges as well as contract rate and assuming, on the average, repayment at end of 10 years. Rates beginning January 1973 not strictly comparable with prior rates.

Source: Economic Report of the President, February 2006, p.368.

5.1 The Liquidity Preference Theory of the Term Structure

If any credit risk is involved at all, the short-term issue is safer because the borrower's position at repayment time is more easily forecast. Hicks (1937) referred to the additional yield on longer-term instruments as a "liquidity premium". Furthermore, short-term debt instruments are less subject to the interest rate risk. If the basic interest rate rises, the near maturity date of the short-term issue prevents any significant capital loss. In the same circumstance an investor in long-term bonds may take a considerable drop in price if he wishes to sell them on the market. Because by and large the investor risks less on short-term issues, in a normal market the short-term rate is generally below the long-term rate.

5.2 The Pure Expectations Theory of the Term Structure

The pure expectations theory of term structure of interest rates holds that the expected one-period return on investments is the same, regardless of the maturity of the security. The rate of interest, or yield, on a band is its current, or spot, rate. A forward rate is interest rate that will prevail in the future. If the current (spot) two-year rate is R2, and the current three-year rate is R3, then there is a one-year interest rate, two years from now, denoted r_1, that equates the two-year and three-year bond yields.

$$(1+R_3)^3 = (1+R_2^2)^2(1+r_1)$$

$$1+r_1 = \frac{(1+R_3)^3}{(1+R_2)^2}$$

$$r_1 = \frac{(1+R_3)^3}{(1+R_2)^2} - 1$$

If the current two-year bond rate is 4 percent, and the current three-year bond rate is 5 percent, then the one-year bond rate, two years from now, should be

$$r_1 = \frac{(1.05)^3}{(1.04)^2} - 1$$

$$r_1 = \frac{1.1576}{1.0816} - 1 = 7.03$$

If the one-year bond rate two years from now exceeds 7.03 percent, then the investor should have purchased the two-year bond and reinvested the proceeds, rather than purchase the current three-year bond. It is obvious to the reader that an infinite number of expectations are incorporated into the yield curve. When the short-term rate rises above the long-term rate, it may be because of an inflationary condition which is expected to decline in the future.[9] A general forecast that the long-term rate is relatively high and likely to decline will lead borrowers to postpone long term borrowing and finance short term for the time being.[10]

5.3 The Market Segmentation Theory of the Term Structure

Life insurance companies are renowned for being able to forecast when their clients will die, and thus can manage their cash flow, leading them to be one of the larger purchasers of corporate bonds, and being able to operate in the longer time to maturity instruments. There is a “market segmentation” theory of the term structure of interest rates which holds that particular financial intermediaries, matching their asset and liability lives, operate in different regions of the yield curve. This is an unlikely theory for a large fluid market.

6. STRUCTURE OF RATES AND FINANCIAL STRATEGY

Knowledge of the factors affecting the general level of the rates and the time structure of the rates is important to both the investor and the corporate financial management. If the management desires to save on costs, it needs some insight into the structure and level of the interest rate and the factors likely to affect its future course. The timing of an issue is an important consideration. By anticipating long-run needs for funds, management can advance issue dates to take advantage of prevailing low rates; by financing short term, they can defer an issue if the long-term rates appear cyclically high. In addition, since the maturity date of issue is a variable feature up to the time it is floated, management should try to ascertain the best maturity for an issue, considering both present and future costs.

When a firm decides whether it can make profitable use of long-term borrowed capital, the question arises of exactly how high an interest rate it has to pay. As the previous discussion indicated, the going interest rate and the length of the maturity of the issue have a great deal to do with the effective interest rate the firm has to offer in order to float its bonds. Also to be considered are the general credit standing of the firm, the type of issue, and the financial structure the firm already carries. If the firm is considered sound, with a good history of repayment on past obligations, having a good market position for its product and a relatively stable demand, its interest cost tends to be low. The greater the equity the firm has relative to its debt, the lower is the interest rate it has to pay. A heavy amount of debt in proportion to the firm's ownership capital (residual risk-bearing capital), calls for a higher interest rate on any given issue.

Setting the Rate on a New Issue. A firm's investment bankers can evaluate a prospective issue and indicate the approximate interest rate it will have to bear. Many issues are already being traded on the secondary market, and some are likely to resemble the position of the proposed issue. A fairly precise estimate of the necessary interest rate can be achieved by comparing the new security to those with similar features already on the market.

The commission to be paid the investment bankers for underwriting and selling the issue is another cost entering the calculation. These commissions, or flotation costs, are relatively low on high-grade debt issues. Flotation costs are brought into perspective by comparing the effective yield which the investors will obtain (as determined by the market price they pay) and the effective interest rate the company pays (as determined by the net proceeds of the issue). The difference between these two rates represents the flotation costs.

Often a new issue is not floated at par, but at a small discount or a small premium. The coupon rate on bonds is customarily set at round percentages or fractions, such as 4 per cent, 4 ½ per cent, or 5 per cent, occasionally at quarters, e.g., 4 ¾ per cent or 5 ¼ per cent; hardly ever are any fractions below ¼ per cent used. Effective yields on the market, however, move over a far more continuous range than the coupon rates. Thus, if the effective rate on the market is 4.68 per cent for a given class of 30-year bonds and a firm floats a new issue with a coupon rate of 4 ¾ per cent, the new issue will be priced out at 101 ½, a premium of 1 ½ points, making the effective rate 4.68 per cent. Similarly if a new issue bore a 5 per cent rate and the going market rate was 5.10 per cent, it would be issued at a discount; it would sell for 99 5/8. On the issuing company's books, bond discounts are carried as deferred debits; bond premiums are carried halfway between the liability and equity section as a deferred credit. Each interest payment period, a proportionate amount of the discount or premium is amortized and applied against the current charge for interest expense. As the discount is amortized it increases the current charge for interest expense, whereas the amortization of a bond premium reduces the amount charged for interest expense. Although bond premium and discount complicate the accounting, there is no particular advantage or disadvantage to issuing bonds at a discount or premium; in most issues the coupon rate is set as close to the market as possible in order to float the issue near par. If the firm sets the coupon rate above the market, it can obtain more funds than the face value of the issue, but it pays for these funds through the higher than necessary coupon rate. On the other hand, a firm can set the coupon rate below market; it saves on the rate but does not obtain the full face value of the issue. In any case, the effective rate the firm pays on the net proceeds it receives from an issue is the true explicit cost of these funds.

7. THE CALL FEATURE ON BONDS

About 95 per cent of corporate bond issues outstanding today carry a call feature. A provision in the bond indenture enables the company to call, i.e. retire or pay back, some or all of the bonds before maturity at the company's option. The firm exercises its option by paying a penalty or call premium of a few points above the face value of the bonds. The general call premium is usually set somewhat higher than the sinking fund call and declines over the life of the issue so that it reaches zero near the maturity date.

The call option gives the borrowing firm an opportunity to repay its obligations before maturity, should any of the following develop: (1) The corporation obtains a heavy inflow of funds, and the best use of these funds at the moment appears to be a repayment of debt in order to save the interest charges. (2) New financing seems desirable (possibly in connection with an acquisition or merger), and the old debt contains some onerous or restrictive provisions interfering with the new plans. (3) Interest rates in the market drop, and the company can save on interest costs by calling the old issue and replacing it with a new one at a lower effective rate.

Replacing one issue with another, refunding before maturity, has many interesting facets. In favor of the operation is the lower effective interest rate obtainable; opposed to it is the call premium, other costs of retiring the old issue, and flotation costs on the new issue. However, the profitability of the maneuver can be ascertained by studying the market. The price the old issue would sell at, if there were no call, can be calculated by applying going market yields to the issue and obtaining the estimated free market price.[11] The problem can be illustrated by an example:

Amount of bond issue	$10,000,000
Coupon rate	5 ¼ per cent
Years to maturity	25 years
Call price at this time	104
Present market interest rate on similar bonds	4 ½ per cent
Additional expenses of calling old bonds and floating new issue	$250,000

If there were no call feature, the old bonds would sell on the market for approximately 111 ¼ giving a yield to maturity of 4.5 per cent. The net present value of the interest savings on a refunding operation can be obtained by subtracting the call price and the additional flotation expenses from the implicit market price, thus:

Implicit Market Price (old bonds) of the whole issue		$11,125,000
Less: Call Price	$10,400,000	
Additional Expenses	250,000	
		10,650,000
Net Present Value of annual interest savings over the life of the issue		$ 475,000

In the problem above, the annual difference between the interest charge on the old bonds at 5 ¼ per cent and the interest rate obtainable on a new issue at 4 ½ per cent comes to $75,000 ($525,000 minus $450,000) for twenty-five years. Against this saving must be set the call premium of $400,000 and various additional flotation and retirement expenses of $250,000. The solution illustrated essentially brings all the items to a present value basis and gives the immediate value of the savings obtainable on a refunding operation.

The call feature operates essentially for the benefit of the borrowing firms because they can retire the bonds when it is to their advantage. For the investors in the bonds, the call feature may deprive them of capital appreciation on their bonds or of receiving the benefit of the higher contractual interest rate if the market interest rate falls. On the other hand, when easy money prevails and the long-term interest rate is low, investors are not too concerned about giving the corporation a relatively flexible call feature. With the interest rate already at a secular low, it does not seem that any further drop would be sufficient to make a refunding worthwhile. When interest rates are at a "normal" level bond investors are more wary of allowing the company too lax a call feature. The call penalty or premium may be set a bit higher, perhaps the initial coupon rate may be set a fraction of a point higher, and/or the bonds may be made noncallable or nonredeemable for a certain number of years after issue.

8. CONVERTIBLE BONDS AND BONDS WITH WARRANTS ATTACHED

A convertible bond or debenture may at the option of the holder be turned into the common stock of the company at some agreed ratio or rate of exchange. Sometimes the convertible feature involves a fixed ratio; a $500 debenture may be turned into ten shares of stock. More commonly, the debentures may be turned into common shares for a fixed amount of face value plus an additional set amount of cash. For example, $50 of face value of the debentures plus $20 in cash can be turned in for one share of common stock. Often the cash premium increases over time to compensate for the likely rise in the book value of the common shares. The agreement on the conversion privilege allows for a compensating adjustment in the rate of conversion in case of any stock splits, stock dividends, etc.

A warrant differs from a conversion feature in that the warrant can be detached from the bond and exercised separately. A warrant entitles its holder to a share of stock upon surrender of the warrant plus, usually, a set amount of money.[12] Some warrants run indefinitely, whereas others expire after a given term. Again, as with the convertible, the cash requirement may be increased at a set rate over time. Since the warrant can be detached and exercised separately, the original holder can sell his warrant and the subsequent holder can exercise the warrants, hold them, or trade them as he sees fit. A regular trading market may develop for the warrants.

Whereas the call feature operates for the benefit of the corporation, a conversion feature is to the advantage of the security holder. If the company's fortunes are fair, the owners of a convertible security can hold on to their bonds and obtain the contracted income and repayment of the principal at maturity. If the firm does well, the owner of a convertible security can choose to change the bond into common stock, sharing its increased dividends and appreciation. (Of course, this does not preclude the possibility of a secondary purchaser of a convertible security paying a relatively high premium for the conversion feature and suffering a decline in the value of the investment if the underlying stock drops on the market.)

The market price of a convertible security is subject to forces in addition to those affecting the ordinary bond or debenture. If the conversion feature is not immediately valuable, the bonds will sell close to their basic investment value, i.e. their value as a normal credit instrument. But if the market price of the underlying stock is high enough, the market price of the convertible bonds is determined basically by the price level of the shares. In no case will the bonds sell below their conversion value. As a matter of fact, in an optimistic atmosphere, market forces may push the price above the conversion value, so that a premium exists for the conversion privilege beyond its explicit value.

Some issues are both callable and convertible. If the conversion value is high enough, such bonds furnish an exception to the rule that a security cannot sell above its call price. Here the rule that an issue never sells below its conversion value has more force. If a purchaser buys a bond above its redemption price but at its conversion value into common, he has nothing to fear from a call. If the company calls the bond, he can escape loss by turning the bond into its equivalent in common stock. If he wants his investment back, he can sell the shares. Or he can find someone willing to buy the bonds and make the conversion; there exists a going market.

Since a convertible issue may be eventually turned into common shares, the common stockholders are generally given the pre-emptive right on new convertible issues. This right is especially important where the price on new securities is below their immediate conversion value.[13]

The disadvantage of the convertible security rests on the potential dilution of the per share earnings of the common stock when and if the senior issue is converted. On the other hand, there are occasions when the convertible is the easiest and cheapest issue to float and is most readily accepted by the market. For some issues, the risk position is such that at the given interest rate the convertible feature is necessary to make the issue attractive to outside investors.[14] Convertible debentures often appeal to institutional investors, who are generally limited to a small amount of stock in their portfolio. A convertible debenture may be on the legally approved list for insurance company portfolios, and still give the investment department a chance to try their hand at making a little capital appreciation.

Sometimes the convertible security is initially floated at a price below its value in underlying shares; basically the company is floating an equity issue. But instead of coming in all at once, the equity funds flow in more conveniently over time. The company gains on the lower financing costs and saves the tax on the interest for the period investors hold the bonds before deciding to convert.

The use of a convertible debt issue seems most logical in the financing of an untried company. The outside investor may want more safety than is provided by common shares and yet desire some gain, if the company is successful, as compensation for the extra risk of investing in a newer or smaller company. The use of convertible debentures, therefore, as the prime financial device of the Small Business Investment Companies in providing capital for smaller firms (falling under the special small business classifications) appears eminently appropriate.[15]

Some explanations given for the use of convertible securities are not always valid. Thus it is suggested that the convertible security is a good method of raising delayed equity funds when the current market for equities (common stocks) is depressed. The convertible security brings in immediate funds; when the stock market recovers sufficiently, the debentures are turned into shares. Thus the company avoids floating new shares at a very low price, and obtains equity funds on better terms after the market rises. The issue of the convertible should be regarded simply as a delayed issue of common stock.

The fallacy in the foregoing explanation lies in the notion that business activities necessarily proceed in a smooth upward trend. But if earnings take a few sharp dips, the in service chases on the debt issue – convertible or otherwise-may prove a strain on the financial resources of the firm. (Under such circumstances, obviously, the debt holders do not convert.) It is precisely the initial risk-bearing characteristic of equity financing, that is, the non-fixity of its' return in good or bad times, that makes it an important part of the financial mix. The convertible issue (as long as it is outstanding) provides none of the cushion against business fluctuations which constitutes the uniquely valuable aspect of common stock financing. Thus the convertible issue will do the company no good if its estimate of future business developments is wrong. Moreover, if the company were certain that its shares were undervalued, it would do better to raise present funds with a callable debt issue. When the company's shares rise in price later, new stock can be floated, and the debt retired. There is no additional risk in this procedure over the flotation of a convertible, and if the company's fortunes improve, the present shareholders do not have to sacrifice part of their earnings gain or capital appreciation to the holders of the convertibles.

9. THE ADVANTAGES AND DISADVANTAGES OF LONG-TERM DEBT

To the conservative investor a bond represents a relatively safe investment of his money at a stated rate of return. True, there have been some defaults on bond issues with subsequent losses to the bondholders, but by and large a diversified portfolio of bonds in the past has earned enough to cover any loss in principal and still give its owner a positive rate of return. (Substantial evidence indicates that over time a diversified mix of secondary class bonds has outperformed prime bonds.[16]) Because of their relative stability, bonds are a desirable component of the investment portfolio of insurance companies, pension funds, and other financial intermediaries, whose own obligations to policy holders, savers, pensioners, and annuitants are generally on a fixed or contractual basis. These financial intermediaries have very substantial funds to invest and are an important part of the capital market.

The desirability of bonds as investment media for large segments of the financial market has enabled corporations to obtain funds on debt issues at comparatively low out-of-pocket costs. This and the fact that bond interest charges are deductible before computing the corporate profit tax, are the main advantage of using debt financing for the firm. On the other hand, the use of debt financing binds the firm to the obligation of periodically meeting fixed interest charges and to the repayment of the principal as agreed. These obligations add certain rigidity to the financial operations and increase the financial risk of the firm.

10. MALKIEL'S BOND THEOREMS

Let us look at several aspects of the pricing of long-term debt, as seen with ten-year bonds. Let us assume that the current ten-year bond yield is 5 percent. Let us further assume that our bond pays an annual (once a year) interest payment. A bond with a coupon rate of 5 percent would sell for \$1000, its par value. If we purchased a 5 percent bond today, and interest rates fell to 4 percent tomorrow, then we would own a bond with a higher yield than the current market bond selling at par, and our bond would sell for a premium, a price exceeding its face, or par, value! How can we price us a bond? Remember that a bond pays interest, and its interest payment is constant during the life of the bond. That is, the interest payment is an annuity, a fixed dollar payment for a specified time period. We can price a bond by calculating the present value of the bond's interest payments plus the present value of the return of the bond principal. In the case of our ten-year 5 percent coupon bond, with a 4 percent yield, the bond price is:

$$Bp = \$50\ (7.7217) + \$1000\ (.6139) = \$1081.15$$

The bond price rises to $1081.15, an 8.1 percent increase. If the interest rate rose to 6 percent, then our ten-year 5 percent bond would not yield a rate equal to the current yield of bonds, and would sell for a discount, a price less than its par value.

$$Bp = \$50\ (7.3601) + \$1000\ (.5584) = \$926.41$$

Note that the value of the bond falls to $926.41, a loss of 7.36 percent if the interest rate rises to 6 percent. The reader notes that if the interest rate rises 1 percent, then the bond price falls 7.36 percent, whereas a 1 percent decrease in the interest rate creates an 8.12 percent bond price increase. We can establish two of Malkiel's bond theorems:

(1) a rise in the interest rate causes bond price to fall, whereas a decrease in the interest rate causes bond prices to rise;
(2) the bond price appreciation when interest rates fall is greater than the bond price depreciation when interest rates rise.

Let us now create a 3 x 3 bond price matrix to establish several additional bond theorems:

Coupon Rates:		4.0	5.0	6.0
Yields (Interest Rates)	4.0	$1000.00	$50 (8.1109) + $1000 (.6756) = $1081.15	$60 (8.1109) + $1000 (.6756) = $1162.25
	5.0	$40 (7.7217) + $1000 (-6139) = $922.77	$1000.00	$60 (7.7217) + $1000 (.6139) = $1077.20
	6.0	$40 (7.3601) + $1000 (.5584) = $852.80	$50 (7.3601) + $1000 (.5584) = $926.41	$1000.00

or

	4	5	6
4	$1000.00	$1081.15	$1162.25
5	$922.77	$1000.00	$1077.20
6	$852.80	$926.41	$1000.00

If the initial interest rate was 5 percent, and interest rates fell to 4 percent, which can be caused by a Federal Reserve (the "Fed") Federal Funds rate cut, then a 4 percent coupon bond rises in value from $922.77 to $1000, an increase of 8.37 percent. The corresponding appreciations for the 5 and 6 percent coupon bonds are 8.12 and ($1000 to $1081.15) and 7.90 percent ($1077.20 to $1162.25), respectively. When interest rates fall, and bond prices rise, an investor's return is higher in lower coupon bonds. If the Fed raised interest rates from 5 to 6 percent, the 4 percent coupon bond price falls to $852.80, a decline of 7.58 percent. The corresponding depreciations for 5 and 6 percent bonds are 7.36 ($1000 to $926.41) and 7.17 ($1077.20 to $1000) percent, respectively. An investor's loss is minimized in higher coupon bonds when interest rates rise. It appears that the lower coupon bonds experience the highest appreciation when interest rates fall, and the highest depreciation when interest rates rise. A third bond theorem by Malkiel holds that the lower the coupon rate, the greater the change in bond prices; for a given change in the interest rate. The relationship between coupon rates and changes in interest rates is an elasticity concept.[17] The ultimate interest rate play is to purchase zero-coupon bonds if interest rates are expected to decline. The fourth bond theorem holds that the longer the time to maturity of the bond, the greater the bond price volatility for a given change in the interest rate.

If the initial interest rate was 5 percent, and interest rates fell to 4 percent, then a 5 percent bond would sell for $922.77, a loss of 7.72 percent. A 4 percent coupon bond would fall in price from $1081.15 at an interest rate of 5 percent to $1000, or par. The 4 percent coupon bond declines 8.12 percent of its value. A corresponding 6 percent coupon bond falls from a price of $926.41, at an interest rate of 5 percent, to $852.80, at an interest rate of 4 percent. The 6 percent coupon bond falls 7.58 percent when interest rates rise. If interest rates rise from 5 percent to 6 percent, the 4 percent coupon bond rises to $1162.25, an increase of 7.50 percent, while a 5 percent coupon bond rises to $1077.20, a 7.72 percent increase, and the 6 percent coupon bond rises from $926.41 to $1000, an increase of 7.94 percent.

11. RETIREMENT OF DEBT

Corporations find it profitable at times to add to their debt financing. Other circumstances may call for the reduction of debt. An actual reduction of the aggregate amount of debt financing should, however, be distinguished from merely shifting its distribution or form. A firm may retire particular debt instruments or issues, yet the total amount of debt financing remains constant. Moreover, if ownership funds and debt financing are substitutable for each other within limits, the range in which various types of liability financing, i.e., bank borrowing, open book credit, and funded debt, may be substituted for each other is far wider. It is easy to detect the ordinary refunding operation either at or before maturity when one issue is directly replaced by another; but if a firm gradually accumulates funds from many credit sources to repay other debt instruments, what appears to be a retirement of debt is actually a mere shifting within the debt structure.

For purposes of this discussion, debt reduction is defined as the retirement of a debt issue with no significant increase in other debt forms to replace it. Discovering when a firm has retired debt under this definition is more difficult than it sounds. If the balance sheet of a firm is compared immediately before and after a legal or accounting retirement of a debt issue, then, of course, there always appears to be a reduction of total debt. To be useful, however, balance sheet comparisons and application of funds analysis should be made over a relevant time period or periods. This time period need not necessarily be the regular or fiscal period. The period selected for review can be less or more than a year, depending upon what sort of information one hopes to uncover. At any rate, in order to measure debt reduction, a sufficient time span should be allowed in order to observe if there has been a build-up of floating debt on the way to the absorption of a funded issue.

There are really only two reasons for a decrease in total debt, as distinguished from a redistribution of debt. Either the firm is moving toward a more conservative capital structure, or it is moving toward a smaller scale of operations, or perhaps both. The capital structure can be modified in a conservative direction (i.e., toward less risk and less potential equity income) by processes other than reducing debt. If a firm's expansion is financed with a larger proportion of equity funds than existed in the original capital structure, the resulting capital structure will be more conservative. If the analyst concerns himself only with funded debt and capital stock as constituting the capital structure, it is possible to overlook another method by which the firm's financial structure can be made more conservative. A firm that floats bonds to provide net working capital – i.e., to reduce its dependence on short-term debt-generally lessens its short- or intermediate-term financial risk. The firm has either decreased its current liabilities – funded its current debt – or added to its current assets, in any case improving its current ratio or working capital position. That a firm reduces risk by this type of action is widely acknowledged, yet it might be missed in practice by financial analysts who concentrate on the bond-to-stock relationships. The reduction of debt is not a necessary condition for a less risky capital structure, since this can be accomplished by other means. Nor is it a sufficient condition, since if the equity contribution decreases at a more rapid rate than debt, the result will be greater risk than before.

The equity funds may be reduced by losses or withdrawals even while the firm is repaying debt. In this case, of course, the scale of operations is necessarily decreased. If, however, debt is reduced while net worth is held intact or decreased by only a moderate amount in comparison to the decrease in debt, there is both a reduction in the scale of operations and a more conservative capital structure.

Toward a More Conservative Capital Structure. The motives underlying the shifts in capital structure entailed by a reduction in debt vary. A move toward a more conservative capital structure is probably a sign of the advancing maturity or solidity of the firm. Many newly established firms commence operations with a high financing risk. This may be the only way they can get started. If the firm begins to operate successfully, management acts to strengthen its capital structure; possibly by funding short-term liabilities (since in new business sources of short-term capital are relatively less scarce than long-term funds); perhaps by accumulating net worth at a greater rate than liabilities; or perhaps by actually retiring some debt. As the firm approaches maturity, and its rate of growth slows down, the risk attendant upon the capital structure of the intermediate, still moderately growing firm may seem too great for a conservative management, and debt may be scaled down still further. Perhaps in older firms, management might judge that the only major use of retained earnings is to repay liabilities. In this case, the reduction of debt may be carried to a point where the capital structure is pushed past its optimum position on the conservative side.[18]

Decreasing the Level of Operations. A decrease in the level of output takes place whenever the firm faces a seasonal, cyclical, or secular decline in demand, or possibly a decline in its competitive position. A decrease in production also occurs if the firm's marginal costs rise without a compensating increase in demand. The change in the firm's financial structure corresponding to the decline in output insofar as the management can control these changes on the downturn – is largely affected by the situation the management thought it faced. A seasonal decline in demand is traditionally taken up by the repayment of current liabilities. This is a task of working capital management – the control and financial management of the current cash flow. A cyclical or temporary decline in the firm's position probably finds the management retiring debt while attempting to hold the ownership capital constant except as it might be impaired by unavoidable losses. At junctions such as this flexibility, in the capital structure is important. The firm would like to be able to manage an orderly retirement of debt, enabling it to maintain its credit and capital base intact. Thus its survival chances would be high, and it could resume expansion on borrowed funds when the economic climate once again became propitious.

If the decline in the scale of the firm's operations is expected to be secular or permanent, the company will move toward a smaller capital structure. The mixture of debt and equity in the new financial structure would be appropriate for the new size of operations, given risks and costs, and both liabilities and net worth would be reduced in proportions resulting in a balance sheet tailored to the new situation. Management occasionally resists the movement toward a smaller balance sheet. The result is likely to be a redundant asset structure. The firm is over-conservatively financed, and it holds far too much cash and reserves in relation to its real output. This situation, however, is an aberration and not a rational development of managerial responsibility. Though it may exist for a while, it will hardly last indefinitely. Such a firm is ripe for a merger offer or a proxy fight.

A reduction in the absolute amount of debt is, in general, more probable during a decline in the rate of expansion – possibly a contraction in output and an actual decrease in earnings – than during periods when the firm appears most prosperous. To the unsophisticated, it may seem an anomaly that debt can be reduced when earnings are declining. But obligations are not necessarily paid with earnings; they are paid with cash. These are related but are not identical. Thus there may be an automatic increase in available cash (even with a decline in earnings) if accounts receivable are collected and new credit accounts are not created at the same rate, or if inventory is sold off and not restored to its previous level. Quite simply, a reduction in gross working capital assets releases cash funds, and these may be applied against debt if the level of operations is declining.[19]

Similarly the noncash charges against earnings, such as depreciation, depletion, or amortization, represent a cash flow which is independent of net reported accounting earnings and even, in a sense, of current losses. As long as current operating losses do not exceed such noncash charges as depreciation and there is no build-up of other nonliquid assets, these charges represent a net source of funds to the firm. In periods of contracting activity a logical use of these funds would be the reduction of outstanding debt.

Methods for Retiring Specific Issues. A whole system and complex of clauses can be written into the bond indenture for the purpose of setting debt retirement terms. There are four basic methods, however, by which specific debt issues can be repayed; and all debt retirement plans consist of one or a combination of these four methods:

1. Repurchase on open market.
2. Repayment at maturity.
3. Repayment of the bond issue by periodic payments.
    a. Sinking fund bonds.
    b. Serial bonds.
4. a. Callable bonds permitting retirement before maturity in whole or part.
   b. Callable convertible bonds which may permit forced conversion.

Most marketable bond issues today have become fairly standard. They call for a definite maturity date, averaging about 30 years, before the bulk of the issue becomes due. They usually have a partial sinking fund provision requiring the company to retire about 2 per cent of the original issue yearly, leaving about 40 per cent of the debt to be met at maturity. The sinking fund trustees may purchase the yearly retirement quota at market or use a sinking fund call provision (paying a slight premium over par), whichever is cheaper. Most bonds contain a call provision enabling the issuer to call back the bonds in whole or part before maturity by paying a fixed call premium over the par value. This general call premium is higher than the one that prevails on bonds bought back under the sinking fund provision: however, both kinds of call premium are highest near the date of issue and decrease in some regular manner over the life of the bonds. On occasion bonds have been issued which are not redeemable under a general call for, say, the first five years. This enables the lenders to enjoy at least a few years of good interest rates if the bonds were floated in a period of relatively high rates.

Repurchase on the Open Market. A basic tool of the management used to retire debt, unless the issue has been privately placed, is repurchasing the debt on the market. If the company wishes to pay the going market price, there is no reason why it shouldn't buy back its own bonds or notes and thus effectively reduce its debt. This method is the only way a perpetual bond can be retired, but it could be used on all other issues. The disadvantage of market retirement arises if the company has made a bad bargain-sold bonds at an interest rate that is now appreciably above the market rate. It would have to pay a heavy premium in the form of an increased market price to be released from its contract of debt.

The ability to repurchase on the open market can be valuable, and the loss of this ability is a chief drawback to private placement. Of course, if the firm presents an attractive proposition to the insurance companies or other financial institutions holding its bonds, these institutions would surely accept it. They would be able to use the funds released just as gainfully in an alternative investment. A repurchase of debt from private holders would have to be negotiated, however, and a price approximating the market price agreed upon. A purchase from the open market involves no such negotiation, and the amount to be bought at any particular time can be readily varied. A possible objection to a firm's repurchasing its debt on the open market is that the technique could be used to favor one set of creditors over the others. A shaky firm might use funds to buy back a junior issue, releasing these holders from risk while increasing the risk to the holders of the senior issue. That this is a possibility is attested by the attempt to guard against it by inserting minimum working capital maintenance requirements in most bond indentures. This abuse of purchasing on the open market would take place only if the management had questionable motives. In most cases, the management would not buy the junior issues if the firm's survival position were dubious, because the increased remaining risk to the senior securities would be even more intensified for the common stock.

Repayment or Refunding at Maturity. The due date, or date of maturity, is the stated time the corporation promises to pay a specific debt instrument. The maturity date permits the borrower and the suppliers of funds to reassess their positions, and by terminating the old debt contract, it allows them to negotiate a new loan under current market conditions. Thus the maturity date protects both the borrower and the lenders if later developments should make the initial debt terms disadvantageous to either party. If credit conditions have moved in its favor, the firm can get out of debt at par, without paying a premium. On the other hand, the maturity date assures the security owners of some positive action. The issue must be paid at maturity, as agreed, or else the bondholders begin action to enforce their claim. Thus the maturity date enables the bondholders, as well as the corporation, to limit the losses arising from an incorrect forecast of the general market interest rate or the specific risk rate for the firm.

Since a longer term to maturity on a bond lengthens the time during which the lenders cannot renegotiate, it increases the risk and interest charges. The due date is an important item upon which the firm and the investors must agree. The specific terms of an issue, including the length of maturity, are part of the bargain between the demands of the market as represented by the investment bankers, and the concessions given by the borrower.

In most modern bond issues a large part of the debt is retired before maturity by the sinking fund or by partial calls. Even so, the amount of debt to be repayed at maturity is usually too great to be paid back with the cash flow of a given year. If the company is intent on repaying the maturing debt, it must accumulate cash some time in advance. These funds can be invested in short-term liquid assets, but usually the best return on the incoming funds is obtained if they are employed in buying back the issue. Sometimes the firm incurs other debt along the way to provide the funds to pay the bulk of the maturing issue. If so, what appears to be retirement of debt is actually a refunding of the issue once removed.

A financial operation known as refunding at maturity occurs when the firm either puts a new issue on the market to raise funds to repay the old, or attempts an exchange of new bonds with the old bondholders. The latter, sometimes called refunding through exchange, generally indicates financial weakness in the firm. The old bondholders, however, often find it wiser to accept the new securities rather than call for repayment. Perhaps the firm has been meeting interest payments so far, but rather than force the firm to the market place to search for someone else to refinance the maturing debt, the present bondholders accept the offer of new securities, usually with some improvement in the terms. Accepting the exchange offer may be safer for the lenders than attempting to force payment and finding themselves in the midst of a reorganization.

Gradual Reduction of Debt Issue by Sinking Fund Purchase. Originally the sinking fund was thought of as assets set aside by the company for the repayment of the total bond issue at maturity. Today most sinking fund provisions retire only part of the issue, generally around 40 to 60 per cent. Under modern sinking fund provisions, the trustees are directed to buy back a portion of the issue each year at the sinking fund call price or at the market price, whichever is lower. Instead of a formal device to retire the whole debt issue, the sinking fund effects a gradual reduction in the bonds outstanding, and supports the market by giving the holders a probability that some of their holdings will be only short term.

In its earlier conception the sinking fund consisted of assets, earmarked so that confusing them with other assets was impossible. The amount set aside annually was either fixed or contingent upon earnings. Eventually it was to total the amount of the issue. A sinking fund reserve to balance the accumulation of assets in the fund was usually set up on the equity side of the balance sheet. This sinking fund reserve "appropriated" a portion of surplus. Supposedly it served as a reminder to forestall too large a distribution of earnings by an overly liberal dividend policy. The sinking fund assets were far more important in repaying the debt than the so-called sinking fund reserve. A corporation showing a large sinking fund surplus reserve would find it difficult to redeem its bonds if it neglected to accumulate the sinking fund or suffered losses in the sinking fund assets. A surplus reserve cannot repay debt; only assets can do so.

Although the old fashioned sinking fund is still used occasionally on municipal bond issues[20] it is rarely used for corporate issues. The basic disadvantage of an asset sinking fund is the difficulty of finding safe investments with a suitable yield. The sinking fund trustee had to minimize risk in investing his funds. Capital appreciation was not a prime consideration since the fund was to payoff a fixed sum of money. On the other hand, a loss in the sinking fund principal subjected the corporation to considerable hazard. If safety was the major requirement, obtaining a reasonable sinking fund income sometimes posed a dilemma. Suppose that safe investments for the sinking fund had a market yield of only 3 per cent, whereas the market rate for the borrowing corporation was 5 per cent. The real cost of the corporation's borrowed funds exceeded the nominal cost. Assume that the corporation had outstanding $1,000,000 in twenty-year sinking fund bonds, issued at par, with an interest rate of 5 per cent. The yearly interest cost is $50,000. At the end of the tenth year the sinking fund totals $500,000 and earns 3 per cent. During the eleventh year, the firm's net interest cost is $35,000, i.e., $50,000 less the $15,000 interest income earned on the sinking fund. The firm's net borrowed funds are only $500,000-$1,000,000 outstanding on the debt less the $500,000 tied up in sinking fund assets. Thus the real cost to this firm for the use of funds is $35,000 over $500,000 or 7 per cent. Considering all the problems of sinking fund asset selection, the best investment for a bond sinking fund is the retirement of the bond issue itself. Such an investment eliminates all risks, including the risk of market fluctuations present even in prime government bonds. Moreover, the interest cost saved by the sinking fund and the effective market rate on the bond issue are very close.

Thus the present type of sinking fund developed. The bond indentures carry provisions instructing the trustee to purchase a certain percentage of the issue (perhaps a minimum of 2 to 5 per cent) annually. Actual retirement is accomplished by purchasing the bonds in the open market or by call.[21] The specific bonds to be called are determined by lot, so that no buyer knows at the time of his purchase the exact date he may be asked to surrender his bonds.

Reduction of Debt through Serial Issues. An alternative to the modern sinking fund as a method of providing periodic retirement of bonded debt is the serial bond issue.

Under a serial bond issue a definite schedule of maturity dates is established. In effect, there is a simultaneous issue of bonds with varying due dates. The corporation must pay each annual or semiannual fraction of the issue as it comes due. It usually has the choice of retiring a greater amount than the annual installment through the use of the call privilege. Given a plan of repayment so definite, the average interest charges on a serial issue is usually lower than under other systems of repayment.

Serial bonds, although prevalent as state or municipal issues, are not common corporation issues today. They are, however, the basic design of the equipment trust certificate. In general, the most common form for commercial bond issues is the partial sinking fund callable issue.

In order to give a serial bond issue some of the flexibility of the callable sinking fund bond issue, the serial bond issue also often contains a call feature. If the call privilege is exercised, the indenture frequently provides that the longest maturities be called first. This is in marked contrast to sinking fund bond Indentures, which provide for call by lot.

An advantage of the sinking fund issue, for management, is that failing to make the annual sinking fund payments may be less serious than failing to pay a maturing serial bond installment. For one thing, the bondholders often may not know of defaults in sinking fund payments for some time after the event. Second, as long as interest payments are met, the bond trustees may not wish to take action other than registering a protest. Of course, the failure to make the regular sinking fund installments is a breach of contract, and the trustee may appeal to a court of equity to enforce payment of the installment. Such a course of action, however, could conceivably lead to the appointment of a receiver. The bondholders may hesitate to apply so drastic a remedy. The dilemma of the bondholders can be conceived as accruing to the benefit of the issuing corporation, giving it a flexibility not possible under a serial bond indenture. This argument can be overstated; obviously no rational organization enters into a contract with the notion of possibly breaking it. By and large, the sinking fund requirement has to be considered as fixed an obligation as the serial bond maturities.

Debt Retirement and the Call Privilege. The call feature on a bond considerably increases managerial control over the issue; it facilitates a program of gradual debt reduction or perhaps refunding before maturity. Should there be a downward shift in market rates or a strengthening in the firm’s credit standing, the call price places an effective ceiling on the premium that the company has to pay to retire its bonds.

If either the market interest rate or the specific risk rate applicable to the firm declines, then, other things being equal, a firm’s securities rise in the market. However, were the call option an original term of the issue, the firm need not concern itself with what the market price would have otherwise been. It can pay the call price or the market price, whichever is lower. On the other hand, if there were no call provision, a firm seeking to reduce its indebtedness would have no choice but to pay the market rate.

Forced Conversion. If a bond is both convertible and callable, the management may elect to reduce the risk of its capital structure by forcing conversion. If the market price of the common stock rises above the conversion rate, a convertible bond may command a market price higher than the call price. The management is then in a position to force the conversion from bonds to common stock. If the corporation issues a call for redemption, the security holders must convert or lose the difference between the market price of the bond and its call price. Under these circumstances, the firm can reduce its debt obligation and increase its equity capital at the same time.[22] The position of the original shareholders, however, will in a sense deteriorate, since the new stockholders pay for their shares with the surrender of debt whose value, as such, is below the going market price of the company's shares. On the other hand, the original stockholders are presumed to have gained on the initial issue of the convertible securities at a low interest rate, or have been recompensed with salable rights. Furthermore, the management's call only hastens the conversion which, under the assumed circumstances, is bound eventually to take place.

Notes

[1]The trustee is compensated with an annual fee. The business of being a trustee for major corporation issues is concentrated among the larger commercial banks.

[2]The depreciation charges, although they reduce reported accounting earnings are not a current out-of-pocket expense. See Chapter 3 and 4.

[3]To provide a little "sweetening" to attract the investor, the subordinated debentures are often convertible.

[4]A chattel mortgage is placed against personality, movable or personal property as distinguished from realty, i.e., land and building.

[5]In 2003, the S&P 500 Index firms disclosed $482 billion of off-balance sheet operating lease commitments in their footnotes. J. Weil, "Lease Accounting: Accounting Still has an Impact", *Wall Street Journal,* September 22, 2004, A5-A6.

The operating lease commitments were approximately 8 percent of reported debt of the S&P firms. For many firms, operating lease obligations are much higher. When UAL, the parent firm of United Airlines files for bankruptcy in December 2002, its assets were $ 24.5 billion, its liabilities $ 22.2 billion, and its non-cancelable operating lease commitments were $24.5 billion (for aircraft). US Airways had substantial operating obligations at the time of its bankruptcy.

[6]One must discount the difference between the forecasted after-tax cash flow .for the project under a purchase plan and under a rental arrangement, in order to obtain the implicit rate of return on the additional funds required under an outright purchase plan. In general, the rate of return is obtained mathematically by finding the discount factor which equates the cash flow plus any remainder value of the assets with the original investment.

[7]These savings accrue because no deduction would be left for depreciation were the firm to keep the title to the property.

[8]Suppose a firm is given customary terms of 2/10 n/30 e.o.m. This means the firm may deduct 2 percent from the monthly statement if it pays within the first 10 days of the month. If it misses this period, the gross amount is due 30 days from the statement date. The 2 percent discount lost if the firm does not pay within 10 days of the monthly statement amounts to 36 percent on an annual basis.

[9]Although the short term rate went to 22.0% as against 13% on long term treasuries, subsequently as the rate of inflation fell, the interest rates declined, and the long term bonds proved to be the better investment.

[10]For a period in the 1970s, the short-term rate went considerably above the long-term rate during a period of inflation.

[11]This cannot be obtained £or the bond directly from the market because the effect of a drop in interest rates combined with a call price may force the bond investors into a locked-in position. They cannot sell at the call price or lower without losing on the interest rate; potential buyers cannot purchase above the call price because of the obvious danger of having the bonds called in by the company at the lower price. Any sales recorded during such a period are not likely to be normal market sales.

[12]Warrants sometimes appear after reorganizations, when they are given to the stockholders allowing them the chance to get back into the company if the reorganized company should do better than its failed predecessor.

[13]American Telephone and Telegraph Company for years raised equity funds by issuing rights to the stockholders for convertible debentures priced below their conversion value.

[14]This is probably true of the subordinated debentures – a popular security of the large finance companies – which is made more acceptable to the market by its convertible feature.

[15]The Small Business Investment Companies are the outgrowth of the Federal Small Business Act of 1958. A major objective of the Act is to help make more long-term capital available for smaller firms.

[16]See W. Bradford Hickman, *Corporate Bond Quality and Investor Experience*, Princeton University Press, 1958.

[17]The elasticity concept is proportional to the duration concept. Duration measures the sensitivity of bond prices to changes in the yield curve. The yield curve can slope and shift in different scenarios. The duration of a bond may be found by solving the equation:

$$\frac{dP}{P} = -D_i dr$$

where P = Bond price,
dP = Change in Bond price,
dr = change in interest rates,
and D = duration.

$$D_i = \frac{-\frac{dP}{P}}{dr} \cdot$$

[18]One may be tempted to draw an analogy on the financial side to Alfred Marshall's categories of the young and vigorous, the mature, and finally, the old or senile firm.

[19]Of course, if the firm suffers steep losses in the liquidation of current assets, it may experience a stringency of cash.

[20]Sinking funds may be advantageous on municipal issues if the yield on safe taxable Federal bonds is higher than the rate on the tax exempt local bonds. The sinking fund trustees should be careful, however, to choose the maturities of the sinking fund investments to coincide with the due dates of their own bonds if they wish to avoid the possibility of capital losses on the sinking fund assets.

[21]Bonds may also be retired by tender, where bondholders are invited to submit the price at which they are willing to sell their bonds back to the company. The company picks up the bonds tendered at the lowest prices

[22]In rare cases the conversion must be accompanied by a payment of money. The company not only retires the debt issue, it increases equity capital and strengthens its working capital position.

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Chapter 10

DEBT, EQUITY, THE OPTIMAL FINANCIAL STRUCTURE AND THE COST OF FUNDS

Traditionally the capital structure of a firm has been defined as the book value of its common stock, its preferred stock, and its bonds, or fixed liabilities. These items are considered to be the "permanent" financing of the firm. The special importance given to them, however, may lead to error in financial analysis. Thus a company which has only common shares in its capital structure is often described as conservatively or safely financed. But if, for example, the firm has considerable trade debt outstanding, owes on a bank loan, or is tied up with long-run rental contracts, it may not be "safely" financed.

Although distinguishing between current liabilities and longer-term financing is convenient in some analyses, the degree of difference between current and funded debt is often grossly exaggerated. The so-called permanent financing is not unalterable; bonds can be retired, reduced, or increased; so can preferred stock; and the book value of the total common stock equity may also be varied. On the other hand, no operating firm is likely to function without some amount of current liabilities, thus some current debt is permanent to the financial structure. Thus it would be better to consider a firm's capital or financial structure as consisting of all the items on the credit side of the balance sheet representing the equity and all the liability accounts.

An important general tool of financial structure analysis is the ratio of total debt to total assets. Of course, in a detailed financial analysis, the relationships and ratios among the items on the credit side of the balance sheet and among liability groupings and certain assets are significant and useful; but the usual financing analysis may be misleading, when only the fixed debt is employed in depicting the capital structure of the firm.

1. A MOST MISLEADING RELATIONSHIP

Perhaps a most misleading ratio used as index of credit quality is the ratio of debt to the market value of the shares. Too often the market value of the stock is an ephemeral number based on a notion of future growth and hope for the future. If another recommended index is used, i.e. debt service into cash flow, the potential operating coverage of the debt has already been captured. Because cash flow and the market value of the shares are related, the relation between debt and the market value of the stock is not an independent variable.

2. DEFINITION OF LEVERAGE – PROFITS AND FINANCIAL RISK

An important concept in understanding the relationships in the financial structure of the firm is the ancient idea of "trading on the equity" now long going under the current term "leverage."[1] Leverage is the amount of outside funds (debt) the owners use in proportion to their own contributions to the financing of the firm. The use of debt is called leverage because these funds, acquired at a priority of repayment and given a priority of return, widen the potential swing of both gains and losses to the ownership shares. Any earnings on the assets acquired by borrowing in excess of the rate that has to be paid to the creditors belongs to the owners and increases their net rate of return; however, if the earnings on the assets acquired with borrowed funds falls below the contracted rate, or if there are overall losses, the negative difference sharply reduces the rate of return or increases the loss on the equity. But as long as the marginal assets employed in the firm earn more than the cost of the borrowed funds, it will be profitable to use leverage, with the proviso that the financial risk of the firm is not thereby inordinately increased. The degree of leverage in a firm's capital structure is measured by noting how much the rate of return on equity would change with any change in the average rate of return on the total assets. The greater the proportion of outside funds to ownership capital, the more emphatic is the leverage effect.

Some financial analysts apparently recognize leverage only if the outside funds are acquired under a definite contract and the suppliers of these funds are paid a fixed positive rate of return. Leverage is thus limited to the use of bonds, preferred stock, or long-term bank loans. Under this concept many banks, for example, are not considered as leveraged, since they often have no bonds or preferred stock outstanding in their capital structure. Nevertheless, authorities in the field of money and banking note the "highly leveraged aspect" of the typical bank's capital structure, the small percentage of equity in comparison to the total deposits or liabilities carried.

A broad definition of leverage covers the relationship between all the prior claim securities and obligations to the ownership capital. Trade accounts and other current liabilities are included in this concept of leverage. These obligations have priority over the ownership shares; they must be paid at least a zero rate of return. This seems a paradox until we remember that ours is a profit and loss economy. Shareholders may earn a negative rate of return, the owners may absorb losses, but liability claims are not written down unless there is a failure or reorganization. The zero return placed on current liabilities is thus, in a sense, a fixed return, and it accordingly widens the possibilities for gains and losses on the ownership investment just as does any other fund borrowed from outside sources.

3. ILLUSTRATIONS OF LEVERAGE – RETURN AND RISK

The effect of "zero" cost liabilities on the possible dispersion of return for the owners is demonstrated by the simplified example presented in Table 1. The Woodrow firm is financed solely with current liabilities and ownership capital. Whatever the rate of return on total assets, which by accounting definition are equal to the total liabilities and capital, the return on the ownership capital is two and a half times as large. Thus if the Woodrow Corporation earns 10 percent on its total assets, it would earn a before-taxes return of 25 percent on its owners' investment. If, however, the firm should experience even a small overall loss, the rate of loss to be absorbed by the equity capital is again two and a half times as large as the overall rate. Thus if the Woodrow Corporation lost 3 per cent on its total assets, the loss on the ownership funds would be 7½ per cent.

Table 1. Effect of Leverage using Current Debt Woodrow Corporation

Total Liabilities and Capital		
Current Liabilities		$300,000
Surplus	$100,000	
Capital Stock	100,000	
Total Common Stock Equity		200,000
Total Capital & Liabilities		$500,000

Rates of Return at Different Levels of Earnings on Total Assets

Rate of Return (EBIT)* on Total Assets	Total Profit (EBIT) or (Loss)	Rate of Return (EBT)** on Equity (Ownership Capital)
10%	$50,000	25%
5%	25,000	12 ½%
2%	10,000	5%
-0-	-0-	-0-
(3%) Loss	(15,000) Loss	(7½%) Loss
(5%) Loss	(25,000) Loss	(12½%) Loss

* EBIT, earnings before interest and taxes.
** EBT earnings before taxes.

The use of current debt is a cheap method of financing; carried too far, it may become quite risky. Current liabilities constrict the firm's net working capital position. Although current liabilities carry a minimum interest (charge) if any, the principal amount is continually coming due. From this point of view, fixed debt, when it can be obtained on favorable terms, is a safer component of leverage than current debt. The interest charges on long-term debt reduce the profits derived from successful leverage and increase the possibilities of loss in case of downturn, but at least the repayment of the principal of the debt is delayed into the future. Thus the firm has a chance to recover its financial position before the due date.

Table 2. Effect of Leverage using Considerable Fixed Debt Meredith Company

Liabilities and Capital		
Current Liabilities		\$10,000,000
First Mortgage Bonds (4's)		40,000,000
Debentures (4 ½ 's)		15,000,000
Capital Stock 00 Common (1,000,000's)	\$20,000,000	200,000
Surplus	15,000,000	35,000,000
Total Capital & Liabilities		\$100,000,000

Effect of Leverage on the Rate of Return under Variations in the Profitability of the Assets

Rate of Return (EBIT) on Total Assets	Total Earnings before Interest and Taxes	Interest Charges	Earnings before Taxes (loss)	Rate of Return on Common Stock Equity Before Taxes
10%	\$10,000,000	\$2,275,000	\$7,725,000	22.1%
8	8,000,000	2,275,000	5,725,000	16.3
6	6,000,000	2,275,000	3,725,000	10.6
4	4,000,000	2,275,000	1,725,000	4.9
2	2,000,000	2,275,000	(275,000) Loss	(0.8%)
0	-0-	2,275,000	(2,275,000) Loss	(6.5%)

Table 2 illustrates the possible behavior of the rate of earnings on the stockholders' investment as the rate of earnings on the total assets changes, in a firm which has a considerable component of long-term debt leverage. For the Meredith Company, the rate of return on the common stock equity changes by approximately 2.85 percentage points for each percentage point change in the earnings on the total assets. If the company earned 10 percent on its total assets the earnings on the common shareholders' equity would be 22.1 percent; at a 2 percent return on total assets, however, the company shareholders suffer a loss. The Meredith Company must gross 2.21½ percent on its total assets to break even.

An interesting method to calculate the beak-even point of debt and equity financing is to express Earnings before Interest and Taxes, EBIT, as a function of sales. If one calculates the earnings per share (eps) of the debt option, incurring higher interest costs and lower earnings, and equates the eps debt option with the eps equity option, keeping interest expenses and earnings constant, but issuing more shares, one can find the break-even sales level for the debt and equity decisions. For example, let us assume that EBIT equals 15 percent of sales. Interest charges are currently $10 million; there are 5,000,000 shares of stock outstanding; and the firm seeks to raise $100 million of new funds. If the firm's stock price is $100, then the firm must issue 1 million new shares of stock. If the current cost of debt is 8 percent, then the firm must pay an additional $8 million of interest expense. The break-even equation for indifference between debt and equity financing is:

eps Equity= (.15*Sales - $10 MM)/ (5 MM + 1MM) =
eps Debt = (.15 *Sales – (10MM + 8MM))/ 5 MM
(.15*Sales-10 MM)/ 6MM = (.15*Sales – 23MM)/5MM
Sales, Break-even = $586.67 MM.

If sales are expected to be less than $586.67 million, then the firm should issue equity; if sales are expected to exceed $586.67 million, then the firm should issue debt. Management should seek to maximize the earnings per share, eps, of the firm to maximize stockholder wealth.

Leverage is profitable if the rate of earnings on total assets is higher than the going rate of interest on the debt. Of course, the risk to the stockholders of loss and failure in case of a downturn must always be considered. It is generally felt that to finance safely with leverage, the stability of the earnings, or better the cash flow, is more important than its level. The reader is invited to follow the Lerner-Carleton derivation of a return on equity and the issue of leverage. The operating return on assets, ROA, or R is the ratio of the firm's EBIT to total assets. The firm pays interest on its liabilities, L, with a coupon rate of r.

EBIT = R (Total Assets)
Operating Income = EBIT = R (Liabilities + Equity) = R(L+E)
Less Interest Paid = -I = r(Liabilities) = rL
Earnings before Taxes = EBT = R(L+E) – rL
Taxes Paid = -Taxes = t[R(L+E)-rL]
Earnings after Taxes = EAT = (1-t)[R(L+E) – rL]

The return on equity is given by earnings after taxes divided by equity, and is a positive function of the liabilities-to-equity ratio.

$$\text{ROE} = \frac{\text{EAT}}{\text{E}} = \frac{(1-\text{t})\,[\text{R}(\text{L}+\text{E})-\text{rL}]}{\text{E}}$$

$$= \frac{(1-\text{t})\ \ [\text{RL}+\text{RE}-\text{rL}]}{\text{E}}$$

$$= (1\text{ - t})[\text{R} + (\text{R - r})\frac{\text{L}}{\text{E}}]$$

Thus, as long as the return on asset exceeds the cost of debt, then the return on equity rises linearly with leverage. Leverage is extremely important to the firm's stockholders. The choice of capital structure must be made with management's perception of the return on assets, the expected cost of debt, and the financial risk entailed.

4. SURROGATE EVIDENCE ON THE DEVELOPMENT OF "OPTIMUM" FINANCIAL STRUCTURE

The basic types of firms have tended to develop characteristic financial structures. These regularities in the typical financial structures imply that certain similar forces operate on all the firms in an identifiable class. Occasionally an individual firm, because of special characteristics in its financial history or the predilections of its management, may diverge noticeably from the typical structure for a firm in the given industry. Nevertheless, a financial specialist can almost invariably determine whether she is reading the balance sheet of an electric utility, a railroad, a bank, a mercantile, or an industrial firm. Although one utility may differ in its financial structure ratios from another, these differences are usually small compared to the differences from a typical industrial or rail. The persistence of these differences seems to indicate that there is an "optimum" firm financial structure for various industries.

An optimum financial structure maximizes the long-run market value of the firm's common stock. This is not the same as asserting that the optimum capital structure maximizes profit or earnings per share. For both the earnings per share and the risk adjusted rate at which the market capitalizes these earnings must be considered. The amount of financial risk or leverage a firm carries helps set the capitalization rate of the shares. If a firm's financial structure carries too much debt, i.e., borrower's risk, the market may set a lower price for the shares than it would give for similar shares with smaller earnings but a more "conservative" financial structure.

Under "normal" conditions a company can add to its rate of profit by adding more debt to its financial structure. However, leverage increases the potential loss and lowers the survival rate in case of an economic downturn. In setting the value of the shares, investors consider both the financial risk of the firm's capital structure and the intensity of the economic or operating hazards typically faced by the industry. The investing market will accept the sacrifice of some financial safety for increased earnings, as long as other operating hazards are not too high, but it will discount the returns of a firm whose total risk seems too large. The hypothesis that the corporation management attempts to adjust to both economic risk and financial risk to obtain the best possible position for their shareholders may explain why companies in different industries have tended to develop typical financial structures.

If the theory of the optimum capital structure is correct, every firm has a preferred combination of risk and return.[2] Suppose three firms, A, B, C, are engaged in similar operations:

Earnings per share	$ 2.00	$ 2.50	$ 3.00
Market price	24.00	25.00	24.00
Price/earnings ratio	12X	10X	8X

Firm A carries very little leverage or financial risk, Firm B has some financial risk, and Firm C is highly leveraged. The earnings per share are for a "normal year," and the differences in earnings are due solely to the different financial structures. If these conditions prevailed then according to the revealed preferences, of the investors on the market, Firm A is too conservatively financed, Firm B has the optimum capital structure, and Firm C is "overleveraged."

The optimum capital structure not only maximizes the value of the shares, it also implies the minimization of capital costs. The explicit cost of debt is cheaper than equity .As a moderate amount of debt is added to the financial structure, the cost of the financial mix decreases. However, as the proportion of debt in the total financial structure rises, the investors' appraisal of the quality of the debt falls. The cost of borrowed funds rises. In addition, as the internal risk of the firm increases, the price/earnings ratio falls, and the cost of equity funds rises. In an overleveraged company, the cost of the total financial mix is higher than the norm. For the ideal financial structure the cost of capital mix is at a minimum.

5. THE PURE THEORY OF THE OPTIMAL FINANCIAL STRUCTURE[3]

The pure theory of the optimal capital structure, as expressed by Schwartz (1959) is based on the assumption that the firm is a semi-monopsonistic demander of funds from the capital market. By discriminating against the suppliers of funds through employing varying debt instruments and judiciously balancing the total of financial risk and external risks, the firm can achieve an optimum financial structure, reducing total financing costs and maximizing the value of its shares. The parameters constituting the environment in which the firm exists are as follows:

1. The individual firm is confronted by two types of risks. One type we might call the "external risk," the other type the "internal" or "financial risk."[4]
2. The external risks are a composite of the stability of earnings, or cash flow of the firm, and the liquidity, safety, and marketability of the assets typically held by the firm. The level of external risk is in large part dictated by the nature of the industry in which the firm is engaged and is not subject to any great extent to the control of the financial decision-makers.
3. Internal risk is the financial risk of the firm's capital structure. It is set by the types of liabilities (short term or funded) that the firm carries and the total amounts of the liabilities in proportion to the firm's equity capital. The factors constituting the firm's capital or financial structure can be varied considerably by the financial management.
4. The two types of risks together are the sum of the hazards to which the owners and the creditors of the firm may be subjected. The external risks are a parameter given by the nature of the industry; these external risks are borne in mind by both borrowers and lenders and influence the optimum financial risk that different types of firms are likely to carry.

The optimum capital structure for any widely held company is one which maximizes the long-run market value per share of the common stock. This is not quite the same as asserting that the optimum capital structure is one which will maximize profit or earnings per share. For both the earnings per share of stock and the rate at which they are capitalized must be considered. The amount of financial risk that a firm carries helps set the capitalization rate. If a firm's financial structure carries too much borrowers' risk, the market may set a lower price for the shares that it would give for similar shares with perhaps somewhat smaller earnings but less financial risk.

The ability of the firm to set up an optimum capital structure implies the ability to discriminate against suppliers of funds, investors, individuals, or financial institutions, with different preferences for income and aversions to risk. Discrimination on one level leads to complex financial structures. It means that by raising funds through securities and contracts with varying return and security provisions, the firm could lower its total financial costs. On a broader macro level, varying preferences for return and risk, implies that by a judicious mix of overall debt (financial risk) and equity, the firm could maximize the value of its shares (minimize the cost of capital), i.e., achieve an optimum capital structure.

The theoretical trade off for a given firm between the rate of return on ownership capital (equity), the degree of financial risk (debt), and the market preference yielding the maximum price for the shares is illustrated in Figure 1. The financial risk factor is indicated indirectly in Figure 1. It is shown on the horizontal axis, inversely related to the proportion of equity (capital stock) in the capital structure. Thus as the amount of equity capital increases in a particular firm's capital structure, the debt-equity ratio and the degree of financial risk decrease. The conventional rate of return on the equity is depicted on the vertical axis. Because of the pro-forma profitability of leverage, the rate of return on the equity falls as the proportional amount of share financing increases although volatility and financial risk decreases.

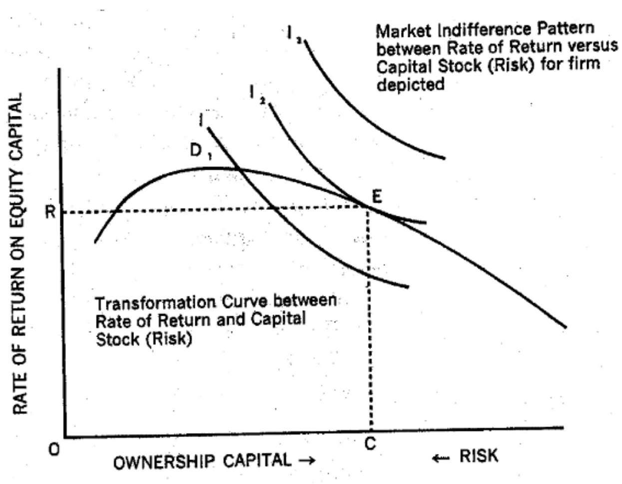

Figure 1. Formal Solution of a Firm's Optimum Capital Structure

The transformation curve D, gives the average rate of return for shares and degree of risk for a financial structure containing varying amounts of ownership capital. Sur-imposed in the figure are investor's indifference curves showing the investors substitution rate between earnings and the degree of risk for a firm of this type. Each indifference curve represents a given constant stock price. The tangency point E indicates the financial structure, the trade off between risk and return which will fetch the highest price for the shares on the market. It is the point where the earnings and the risk adjusted discount rate yields the highest amount.

The tangency point E indicates the optimum amount of equity capital and rate of return on equity capital for the firm. In brief the conditions of the optimum are:

<u>Marginal sacrifice in earnings</u>		<u>Marginal decrease in earnings</u>
Marginal decrease in risk	=	Marginal increase in ownership
(investor's choice)		(decrease risk) (in the financial structure of the firm)

The letter R indicates the rate of earnings on equity investment and OC the optimum amount of equity capital for the firm, setting up the market capitalization rate and expected earnings that maximize the value of the shares.

The optimum capital structure varies for firms in different industries because the typical asset structures and the stability of earnings which determine inherent risks vary for different types of production. The theoretical solution of the optimum capital structure is made in a very formal manner, since it must give consideration to many variables – increasing lender's risk, increasing borrower's risk, the interest rate structure, the forecasted earnings function, and the possibility of discriminating against the market supply of outside capital.

6. MODIGLIANI AND MILLER – CONSTANT CAPITAL COSTS

Contrary to traditional views of the relative costs of debt, equity, and the weighted cost of capital found in Schwartz (1959), Professors Franco Modigliani and Merton Miller (M&M) posited a model where in a non-tax world, for a firm of a given risk class, capital costs are constant regardless of the financial risk.[5] There is no optimum financial structure.

In the M&M model, the trade off between financial risk and the cost of funds is unitary; if more debt is added to the financial mix, the cost of debt rises and the desired rate of return on equity rises, so that the weighted cost of the financial mix remains constant. Let us briefly recount the three propositions of M&M in their seminal presentation of the cost of capital and valuation.[6] First, M&M hold for many firms in the same line of business, the cost of capital is a constant, ρ_o. The constant is determined by dividing the expected return per share by the stock price; i.e., the cost of capital is determined by dividing net operating earnings of the firm by its total market value of the firm. Hence, the M&M hypothesis is often referred to as "The Net Operating Income" approach.[7] Thus, the average cost of capital is independent of capital structure. Second, the expected cost of equity rises linearly with the debt-to-equity ratio. The earlier Lerner-Carleton derivation is a variation of the M&M Proposition II. M&M argued that the firm must earn a return on investments exceeding ρ_o. M&M's Proposition III holds that if the firm earns at least ρ_o on its investments, the project(s) is acceptable regardless of the securities issued to finance the investment. M&M presented empirical evidence in their 1958 study, using the 40 firm electric utility study of Allen (1954), and the 42 firm oil company sample of Smith (1955). Both Allen and Smith provided data on the average values of debt and preferred stocks and market values of securities, such that M&M could calculate the debt-to-total value of securities ratio, d. M&M regressed the net returns , x, defined as the sum of interest, preferred dividends, and net income, as a function of ratio d. The Allen electric utility sample covered 1947-1948 and the Smith sample of oil companies was for year 1953. The M&M regressions were:

Electric Utilities	$x = 5.3 + .006d$
	(s.e.) (.008)
Oils	$x = 8.5 + .006d$
	(.024)

M&M held that the regression results supported their Proposition I. The calculated t-statistics, found by the ratio of the regression slope, b, divided by its standard error (in parenthesis), should be 1.96 (or 1.645 at the 10 percent level), to be statistically significant. The calculated t-statistic on the electric utility sample is 0.75, far less than 1.645. The calculated t-statistic for the oil sample is 0.25. Thus, there is no statistically significance between net returns and the debt-to-assets ratio in the initial M&M study. We will take a detailed look at hypothesis testing in Chapter 11. M&M used the Allen and Smith samples to test their Proposition II. M&M regressed ROEs, defined by dividing net income by equity, as a function of the debt-to-equity ratio, b:

Electric Utilities = ROE = 6.6 + .017h
(s.e.) (.004)

Oil Companies = ROE = 8.9 + .051h
(.012)

The estimated t-statistics of the electric utilities and oil companies' sample of 4.25 and 4.35, respectively, rejected the null hypothesis of no association between ROE and the debt-to-equity ratio. Thus, support is found for Proposition M&M II, that the cost of equity rises linearly with the debt-to-equity ratio.

A graphic depiction of the M&M model is shown in Figure 2. The substitution rate between the risks and the costs of the elements of the financial mix is linear so that the average cost of capital is constant.

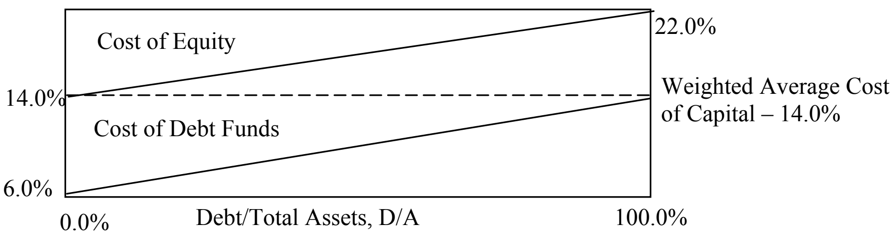

Figure 2. A Graphic Depiction of the M&M Hypothesis

In an equation presenting the M&M hypothesis in a linear form, the function for the overall cost of capital appears as follows:

$$k_o / A = D(i_j + D/_A \bullet p) + E(e_j + D/_A \bullet p).$$

where:

k_o / A = the overall cost of capital
D = the amount of debt the firm carries
i_j = the rate on the very first incremental amount of debt, the pure borrowing rate
$D/_A$ = equals the percentage of debt to total assets, the degree of leverage
A = total assets equals the sum of D and E
E = the amount of equity capital
e_j = the return required on a non-leveraged share of stock for an industry of this risk class
p = the sum of the borrower's and lender's risk premium, set equal to the difference between i_j and e_j

k_i = ($i_j + D/A \cdot p$), it is the overall market interest rate on debt at the given degree of leverage
k_e = ($e_j + D/A \cdot p$), it is the market's desired return on equity at the given level of leverage

Showing how this works in a simple arithmetical example, let us set:
i_j at 6.0 percent
ej at 14.0 percent,
and p becomes 8.0 percent

The result is the same as that in the graph in figure 3. No matter what the degree of leverage, the non-tax cost of funds is constant at 14.0 percent. Moreover in table 3, when the resultant change in the costs of the other components of the financial mix are considered, the marginal cost of capital is constant of 14.0%, again no matter what type of financing is employed.[8]

Table 3. Overall Cost of Funds in a Simplified M&M Model, where the Unleveraged Cost of Equity is 14%, the Initial Cost of Debt is 6%, and the Financial Risk Premium is 8%

	A Total Assets	D Debt	E Equity	k_i Cost of Debt at the Given Financial Mix	K_e Cost of Equity at the Given Financial Mix	Total Cost of Debt Financing	Total Cost of Equity Financing	K_0 Weighted Cost of Total Capital at the Given Financial Mix, k_i x D + k_e x E
1)	100	20	80	7.6%	15.6%	152	1248	14.0%
2)	100	50	50	10.0%	18.0%	500	900	14.0%
3)	100	90	10	13.2%	21.2%	1188	212	14.0%

The simplified version of the M&M model points out its difficulties. As the debt ratio reaches 90 percent of the financial structure, the least economic blip can bring about failure and bankruptcy. The costs of re-structuring after bankruptcy are substantial. On the other hand, if the firm's capital structure is 100% equity, issuing debt increases the return per share without substantially increasing risk. Of course Professor's Modigliani and Miller did not present their hypothesis as a pure mathematical abstraction. They presented devices by which the outside investors could offset any anomalies in the financial structure of firms having marketable shares.

a) Arbitrage

M&M argued that the external investors could engage in arbitrage to create an increased return on shares that were underleveraged. They could increase risk but raise the expected rate of return by employing debt to buy the shares.

The counter argument is that this is not a perfect offsetting tool. There are additional transaction costs, and external debt is more dangerous to maintain under varying returns and asset values, and more dangerous in terms of legal liability to the external or individual investor than the internal debt of the firm.

b) Hedging

External investors could reduce the risk on a firm which was over-leveraged by purchasing both the shares and the bonds (debt) of the firm. This might reduce the expected return but it would provide a minimum fail safe position (i.e., the final value of the bonds) in case of failure.

The counter argument involves the problem of transaction costs and the fact that the offset in holding the bonds is far from perfect in case of failure and bankruptcy. The legal and transaction costs of going through bankruptcy and re-organization is likely to erode a large part of the value of the firm.

The major contribution of the M&M model is to show that each type of financing, debt or equity, effects the cost of the other. Nevertheless when the costs of failure, bankruptcy, re-organization, and various transaction costs are considered, it is clear that the tradeoff is not likely to be perfect. Perhaps we can sum up by noting that the central difficulty of the pure M&M model is the problem of the asymmetry of information. Should not a judicious financial management knowing the environmental conditions of their firm do a better job of setting up the financial structure than the outside investor? And if this is so, have we not arrived at the notion of an optimal capital structure?

Finally, the empirical evidence that financial structures are not random, but appear to be significantly different for varying classes of firms' points in the direction of the existence of optimal capital structure.[9]

Nevertheless, M&M made an important contribution. It is clear that the bounds of the optimal capital structure are much broader than theory would suggest. Secondly, the M&M hypothesis sharpens the argument or more clearly points out the tax advantage (the tax deductibility of interest) of debt under our current corporation income tax laws.

M&M recognized the cost of capital implications of interest deductibility in their original 1958 study. M&M held that the interest deductibility feature of corporate taxation leads to a decreasing cost of capital as the debt ratio rises. By 1963, M&M formulated the before-tax earnings yield, the ratio of expected earnings before interest and taxes, $\overline{x}$, to the market value of the firm, $\hat{v}$, as:

$$\frac{\overline{x}}{v} = \frac{\rho^T}{1-t}\left[1 - t\frac{\cdot D}{V}\right].$$

Due to the tax advantage the cost of capital of the firm decreases with leverage, and the value of the firm will rise with the use of debt.

7. THE OPTIMAL CAPITAL STRUCTURE AND THE M&M HYPOTHESIS

The difference between optimal capital structure theory and the M&M hypothesis can be exaggerated. Both models emphasize the point that the use of one class of financing has rebound effects on the costs of the rest of the financial structure. In the optimal model, the overall cost of capital at any given time is constant within the range of the optimal capital structure. Debt or equity financing or some combination may be used for any particular project, as long as the financial mix is kept within an optimal range. Nevertheless, because every type of financing has interactions with the other sources of financing, the return on a project is not to be compared to the direct cost of its mode of financing but to the overall cost of the financial mix.

In the M&M model, the interaction between different types of financing is complete so there is no optimal financial structure. Thus the firm's overall cost of capital at any point of time is constant at the proper financial mix, or it is constant regardless of the mix. Most importantly, both of these views are in opposition to the sequential cost models, in which the cost of capital depends on the financing which is being used currently, so that the cost is lowest when the firm uses retained earnings, rises for outside borrowing, and becomes still higher when borrowing capacity is strained and additional funds depend on the flotation of new shares. In short, in making real investment decisions, Schwartz and M&M agree that the appropriate discount variable is not the immediate financial source but the overall cost of capital. [10]

8. EMPIRICAL FACTORS INFLUENCING FINANCIAL STRUCTURES

The two main external factors influencing the financial structure of a firm are the composition of its assets, and the stability of its cash flow. Financial firms, such as banks and insurance companies, are prime examples of enterprises where the liquidity and marketability of their assets enable them to carry a high proportion of liabilities. Of course, in this instance, the firm's selection of assets for safety, marketability, and liquidity may be pre-determined by the heavy volume of the firms contingent or short term liabilities, rather than the other way around. Nevertheless, a firm with safe marketable or short-term assets can finance these assets with a high proportion of debt with relatively matching maturities. Thus marketing firms carry short term inventories and creditable short term accounts receivable can safely carry a relatively high proportion of short-term debt.

The stability of cash flow is influential in shaping the financial structure. The cash flow is the amount of free funds the firm can utilize over a short-run period. Cash flow and accounting profits or earnings may differ considerably. Cash flow is less than earnings, for example, by any increases in costs incurred on work in process; cash flow exceeds reported earnings by the extent of depreciation, depletion, and other book or noncash changes – i.e., non-cash charges representing the using up of assets acquired in the past. Although for internal control and budgeting purposes detailed analyses are made of the components of the cash flow, the rough rule of thumb for measuring the cash flow is reported earnings for the period plus depreciation, depletion, and any other noncash charges.

In calculating the leverage a firm might reasonably carry, the financial decision makers must not only estimate the average level of the cash flow over time, but the likelihood and extent of deviations from the norm. Where fluctuations from the average are not expected to be either deep or sustained, the firm may safely carry a high percentage of debt.

The inclusion of depreciation charges in the cash flow helps explain why firms with a good proportion of fixed assets may also carry more long-term debt. The fact that firms having a considerable fixed plant usually float bonds is not related to any physical attribute of the fixed plant; it is not dependent on any presumed safety that bricks and mortar bring to the bond mortgage. The affinity of fixed assets and long-term debt rests on the fact that the cash flow of firms holding considerable fixed assets must exceed their reported earnings. The depreciation charges taken against the fixed assets act as an extra cushion, which, added to the accounting net earnings, may help the firm meet its interest and principal obligations. A firm may show zero accounting profits after depreciation, yet have a positive flow of cash. As long as reported losses do not exceed depreciation and depletion charges, some cash flow will be available to pay debt obligations. In other words, some cash is always generated as long as operating revenues are greater than out-of-pocket operating costs, no matter what the depreciation charges may be.

9. MEASURES FOR APPROXIMATING FINANCIAL RISK

There are no precise methods for measuring the degree of risk in a firm's financing. In practice, however, there are some rough measures of risk that can be computed and then compared to certain traditional "rules of thumb" or "bench marks." These have been established from experience, and not surprisingly, econometric studies have shown that weakness in these measures to be quite predictive of financial failure or bankruptcy.

For current liabilities the best measures of risk are the various working capital ratios. Chapter 5 focuses on credit analysis and risk using these ratios. For long-term debt, introduced in the previous chapter, the best measures of financial risk (or safety) are the various "times interest earned" ratios and the balance sheet financing structure percentages. The most insightful presentation of the financing structure shows the major financing categories as a percentage of total assets. A growing misleading financial structure ratio is the percentage of debt to the market value of the stock! In an over exuberant market, the price of the shares will balloon encouraging the incurring of debt levels which cannot be borne in more reasonable time.

Dividing the annual interest charges into the annual pre-tax earnings gives the interest earned coverage. Other things being equal, the larger the "times interest earned" ratio, the greater the safety of the funded debt. Of course, the coverage the financial analysts deem adequate is larger for an industrial, with its greater likelihood of fluctuating cash flow, than for the base service electric utility company. The rule of thumb minimum requirement for the highest grade industrial bonds is an interest coverage averaging eight times over the last seven years whereas only three times was required for the standard utility bonds.

The measure of earnings generally used in constructing the "times interest earned" ratio is EBIT, earnings before interest and taxes, or gross operating income. The earnings of a firm before interest and taxes represent the difference between costs and revenue; following economic theory, this is the variable the firm attempts to maximize. EBIT is the firm's overall economic return, given the best efforts of the marketing people and those in charge of production costs. Net profit, the earnings of the shareholders is derived from EBIT, but it is also a function of the financial structure, how much goes to bondholders and how much remains for the shareholder.

EBIT is the proper measure of earnings flow adequate to support a given debt structure. Interest is a deductible expense before income or profits taxes are computed. Net after tax profit is an understatement of the firm's ability to pay its fixed charges. Thus, a firm with interest charges of, say, $200,000, reporting a zero income (no profits, no losses), will have covered its interest charges at least once. Assuming a 35 percent average tax rate, the same firm reporting a net after taxes income of $100,000 will have covered its fixed charges about 1.76 times.

The Nemo Corporation has the following financial structure:

Financial Structure

			Percent
Current Liabilities – Trade		$170,000	22
Bank Loan, 4 ½ %		50	
Long-term Debt (5% interest)		200,000	20
Preferred Stock (6% dividend)		30,000	3
Common Stock	$200,000		
Surplus	350,000	550,000	55
Total Capital & Liabilities		$1,000,000	100

and the following income statement:

Income Statement

Revenues	$1,500,000
Operating Expenses	1,300,000
	200,000
Depreciation	50,000
EBIT	150,000
Interest Expense	12,250
Earnings Before Taxes	137,750
Taxes (assume 50% approximate rate)	68,875
Earnings After Taxes	68,875
Preferred Stock Dividend	1,800
Earnings Available fro Common	67,075

($20,000 of fixed debt must be retired for sinking fund every year.)

Using the Nemo Company's figures, we can present examples of various measures of the times charges covered under various definitions and approaches. All of the methods are valid; they vary, but they show different useful relationships. The first example is the coverage ratio most commonly used, and the one which is usually indicated in the term "times interest or times fixed charges earned."

1. Times fixed charges earned (usual basis):

$$\frac{\text{EBIT}}{\text{Interest Charges}} = \frac{150{,}000}{12{,}250} = 12.3$$

> All interest charges are divided into the EBIT. Preferred stock dividends are not included in the fixed charges, since they are not a legal liability of the company and do not have to be met in any given year. Although the sinking fund contribution is an annual obligation, it is not considered an expense or interest charge but a repayment of debt, and thus is not normally included in the fixed charges. Nor is it deducted before computing normal accounting profits or income for tax purposes. In railroad financial analysis, contractual rental payments on leased lines are often included in the fixed charges. In analyzing other types of firms, rental obligations are generally not included in the fixed charges. A firm that rents a large part of its fixed assets may appear much more conservatively financed than a similar firm that has title to its fixed assets and has financed them by borrowing on mortgage bonds. Thus many financial analysts suggest that, at least for internal analysis, some proportion, perhaps a third, of annual rental payments be added to the fixed charges.

2. Times prior charges earned (includes preferred dividends):

$$\frac{\text{EBIT}}{\text{Interest} + \text{Preferred Dividends} + \text{Taxes on Preferred Dividends}}$$

$$= \frac{150{,}000}{12{,}250 + 1{,}800 + 1{,}800} = \frac{150{,}000}{15{,}850} = 9.5$$

This measure (times prior charges earned) includes the coverage on the preferred stock. Although it is a comprehensive measure, it is not commonly used. Since the preferred stock dividends are not deductible before income taxes are calculated, the taxes applicable to these dividends must be added back before the coverage is computed. In the example presented, $15,850 is the minimum the firm must earn, before interest and taxes, in order to cover interest, taxes, and preferred stock dividends. Nevertheless, the preferred dividends are not fixed charges since their payment is at the discretion of the directors, and a decision not to pay is not considered a failure to meet contractual obligations.

3. Times interest earned on a cash flow basis:

$$\frac{\text{EBIT} + \text{Depreciation}}{\text{Interest Charges}} = \frac{200{,}000}{12{,}250} = 16.3$$

The measurement of times interest earned on a cash flow basis is a gauge of the short-term ability of the firm to meet its interest charges. The annual depreciation allowance is not an actual expenditure in any given year, but a: bookkeeping charge to approximate the firm's average annual capital consumption. Funds from both earnings and depreciation – as long as they haven't been shifted into nonliquid assets – are available to pay charges on the debt, at least on a short-term basis.

4. Times debt service charges earned on a cash flow basis:

$$\frac{\text{EBIT} + \text{Depreciation}}{\text{Interest Charges} + \text{Debt Retirement}} = \frac{200{,}000}{12{,}250 + 20{,}000} = \frac{200{,}000}{32{,}250} = 6.2$$

This ratio points out the significant relationship between the cash flow and all the service charges on the debt. Service charges here include interest and the annual obligation to repay part of the principal.[11]

By relating debt service charges to the cash flow we can achieve some estimate of the company's short-run ability to meet its debt obligations. In our example, no tax component is added to the sinking fund charge, although repayment of debt is not deductible before computing profits taxes. However, the funds available from depreciation, which are also nontaxable, more than cover the sinking fund requirement. If the sinking fund requirement exceeds the annual depreciation, it would be necessary to add income taxes to the excess sinking fund requirements before computing the coverage. If the ratio had been calculated as "times debt service charges covered on an earnings basis," the taxes applying to the sinking fund installment would have to be taken into account. Thus if a firm has to meet a $300,000 sinking fund installment and the income tax rate is approximately 50 percent, then the firm has to earn $600,000 before taxes if we are to consider the sinking fund as being paid out of earnings. However, relating the sinking fund payment and the interest charges to the estimated cash flow is the more relevant procedure.

It is apparent that various debt and prior charge coverages can be calculated in many ways. The stability of the coverage is generally more important than the absolute level of the coverage. Thus the ratios are often calculated for five or ten years back; the average coverage for the period is determined and compared to the coverage of a few of the poorest years. A firm showing minimal fluctuations (i.e., one that is probably cyclically resistant) can be allowed a lower average coverage than one whose EBIT shows strong fluctuations and whose coverage of fixed charges in the poorer years shows a wide deviation from its average coverage.

Notes

[1]Called "gearing" in England.

[2]A fuller theoretical discussion of the optimum financial structure may be found in E. Schwartz, "Theory of the Capital Structure of the Firm," *Journal of Finance*, March 1959. The arithmetical example follows the general pattern of Graham and Dodd, *Security Analysis*, McGraw-Hill, 1951, Chapter 37.

[3]E. Schwartz, Op.Cit., *Journal of Finance*, March, 1959.

[4]Financial risk was divided into borrower's risk and lender's risk by Keynes in *The General Theory*, pp. 144-145.

[5]Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, June 1958.

[6]M&M discussed their initial proposition of capital structure irrelevance in terms of a class of homogeneous firms, firms that are perfect substitutes of each other, such as firms in the same industry.

[7]J.C. Van Horne, *Financial Management & Policy*, Prentice Hall, 2002, 12th edition, pp. 255-260.

[8]Modern financial management uses the beta of a security to determine the firm's cost of equity. The reader will see the beta estimation in Chapter 14. The estimated beta is produced by regression a security monthly returns as a function of the corresponding market returns. Because the vast majority of securities have issued long-term debt, the estimated betas involve leverage. The beta of a security rises with debt. M&M II is consistent with estimated betas and costs of equity.

[9]E. Schwartz and J.R. Aronson, "Some Surrogate Evidence in Support of the Concept of Optimal Financial Structures," *Journal of Finance*, March 1967.

[10]Schwartz has observed that the cost of capital is probably more invariant with respect to the debt-to-total assets ratio than he thought in 1959 and observed in 1966.

[11]This is, of course, the concept generally used in local public finance. Since governments do not usually measure their success in terms of maximum money returns and minimum money costs, the commercial accounting that distinguishes between expenses and repayment of principal is not too important. A prime tool of municipal financial analysis is the level of debt service charges related to regular yearly revenues; this relation is some indication of the issuing area's economic ability to carry its debt.

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Problem

1. Is there an optimal debt policy in the US? What is the impact of increasing leverage regarding the market value of the firm? Please discuss the debt theories of Ezra Solomon, the traditional approach to the WACC, and Modigliani and Miller? Mr. X states that growth US economy is driven by equity, because retained earnings are the most important source of funds, whereas capital expenditures are the most important use of funds. Ms Y states that the growth in the US economy is financed by debt, because the issuance of debt has exceeded the issuance of equity in the 1950-2003 period by about 7:1; furthermore equity repurchases have grown relative to dividend payments, as a use of funds, during the 1987-2003 period. Please discuss the statements of Mr. X and Ms Y.

Chapter 11

INVESTING IN ASSETS: THEORY OF INVESTMENT DECISION MAKING

Capital budgeting, or investment decision, depends heavily on forecasts of the cash inflow and a correct calculation of the firm's cost of capital.[1] Given the cost of capital, i.e., the appropriate discount rate, and a reasonable forecast of the inflows, the determination of a worthwhile capital investment is straightforward. An investment is desirable when the present value of the estimated net inflow of benefits (or net cash inflow for pure financial investments) over time, discounted at the cost of capital, exceeds or equals the initial outlay on the project. If the project's present value of expected cash flow meets these criteria, it is potentially "profitable" or economically desirable; its yield equals or exceeds the appropriate discount rate. On a formal level, it does not appear too difficult to carry out the theoretical criteria. The stream of the forecasted net future cash flows must be quantified; each year's return must be discounted to obtain its present value. The sum of the present values is compared to the total investment outlay on the project; if the sum of the present values exceeds this outlay, the project should be accepted.[2]

The formula for obtaining the net present value of a project runs in this form:

$$PV = \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \frac{CF_n}{(1+i)^n} + \frac{S_n}{(1+i)^n} \tag{1}$$

NPV = PV – I.

PV is the present value of the net cash flow stream (CF_1, CF_2, etc.) over time to n years, S_n is the scrap value, or the remaining value of the project at the end of its economic life at year *n*, and *i* is the applicable discount rate or cost of capital. NPV equals the net present value, the present value of the benefit stream minus I, the full investment cost of the project.

If there is a cost for removing the project at the end of its economic life, then S (the scrap value) is negative. If the stream of returns is constant, their present value can be obtained by the summarization annuity formula: $PV = CF\ [1- (1 + i)^{-n}]/i$.

Table 1 provides an example of the mechanics of the capital evaluation problem. The project illustrated would be accepted because the present value of the estimated stream of net returns is \$4,431,470.57, which is \$431,470.57 above the project's initial cost of \$4,000,000.

Table 1. Net Present Value of Capital Project

YEARS	INVESTMENT COST OF PROJECT	ESTIMATED NET ANNUAL INFLOWS	DISCOUNT FACTOR (COST OF CAPITAL =12%) $\frac{1}{(1.12)^n}$	PRESENT VALUE OF INFLOWS
0	$4,000,000	0	0	0
1		$1,000,000	.8929	$ 892,857.14
2		1,500,000	.7972	1,195,800.00
3		2,000,000	.7118	1,423,600.00
4		1,500,000	.6355	635,500.00
5		1,000,000	.5674	283,713.43
6*		500,000	.5674	283,713.43
Total	$4,000,000			$ 4,431,470.57

*Period 6 includes a return of $250,000 and $250,000 scrap value.

Thus, the projected rate of return on the project is higher than the 12.0 percent discount rate, the estimated cost of capital.

1. NET PRESENT VALUE AND THE INTERNAL RATE OF RETURN

There are two standard criteria for selecting desirable projects, but sometimes they may yield conflicting rankings.

1. Net present value. Net present value is obtained by subtracting the initial outlays from the gross present value of the benefits discounted at the given cost of capital. A project is acceptable if the NPV is positive.
2. The internal rate of return. The internal rate of return is the rate that brings the present value of the cash flows into equality with the initial outlay. The equation for the internal rate of return is formally similar to that for present value.

$$I = \frac{CF}{(1+r)} + \frac{CF_1}{(1+r)^1} + \ldots + \frac{CF_n}{(1+r)^n} \tag{2}$$

I (the initial investment) is a given factor and one solves for r, the internal rate of return, i.e. the rate of discount, that brings the present value of the benefits equal to the outlay, I. If the internal rate of return (IRR) exceeds the cost of capital, the project is economically feasible.

In the vast majority of capital investment projects, both criteria give the proper signal as to whether a single project is acceptable. If a project's net present value is positive, it necessarily follows that its rate of return also exceeds the company's cost of capital. The project's positive net present value increases the firm's net income and cash flow and increases its stock price, *ceteris* paribus. However a selection conflict may arise when in comparing mutually exclusive projects, one project has a higher internal rate of return and one shows a higher net present value. If two projects are mutually exclusive, then only one project can be accepted.

2. MUTUALLY EXCLUSIVE PROJECTS

A problem of selecting projects apparently exists when more projects pass the economic test than a fixed capital budget will allow and/or when projects exist that are mutually exclusive alternatives (i.e., only one is to be taken from among several possible projects because they serve the same function). The NPV and the IRR can give conflicting signals in these cases where a selection must be made out of mutually exclusive projects.

As will be shown later, the constraints imposed by a pre-fixed capital budget is the result of a wrongful management decision. Nevertheless, in the general situation, supposedly a conflict in the rankings of mutually exclusive projects poses a problem. However, in every case, NPV indicates the optimum choice.

Projects may show up with conflicting rankings if the following three (not necessarily exclusive) conditions exist:

1. The shapes of the inflows over time differ.
2. The investment sizes of the projects differ.
3. The durations of the inflows differ.

The first condition, i.e., the shape of the inflows, is illustrated in Table 2. Project A has a higher internal rate of return than B (11.3 percent as against 10.0 percent), but given the cost of funds rate of 6.0 percent, Project B's net present value is $113,500 as against $85,000 for A. When this type of conflict in ranking exists, the project with the higher internal rate of return has the higher earlier inflows: The rival project with the higher net present value (NPV) has a greater total inflow and relatively higher returns in later periods. If the decision between the projects is made on the basis of the rate of return, the earlier returns of A are acquired at the sacrifice of the greater returns from B later on and this trade-off is made at a higher rate than the appropriate cost-of-funds warrants.

The effect of the differing shapes of the cash flows (the size of the investment constant) may be further explained with the aid of the graph shown in Figure 1.

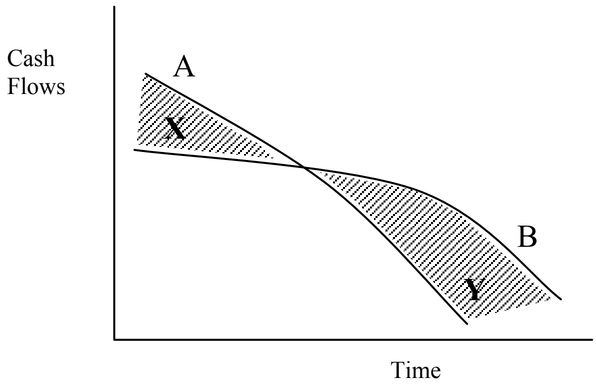

Figure 1. Different Shapes of Cash Flows of Two Investment Options

Project A has the advantage of a greater earlier cash inflow, but Project B promises higher later cash flow.

Indeed, project B offers higher total flow. The area X indicates the earlier differential inflow of A; the area y depicts the later extra inflows of B. Absolute y is greater than absolute x. (If the absolute earlier returns were greater, there would be no problem; A would always win under either criteria.)

If the discount rate were zero, benefits would not be discounted, and B would always win. (B wins at lower rates.) On the other hand, at some high enough positive discount rate, A will win; however, if the going cost of capital is used as the discount rate, and B still shows the higher present value, it follows that the sum of the present values of the funds depicted in y must be higher than the present value of x. Alternatively, if the funds depicted as X were to be invested to earn the cost of capital; they would not grow to equal the amount of Y.

Table 2. Comparison of Projects When the Shapes of the Cash Flows Differ

Project A

YEARS	OUTLAYS	INFLOWS	DISCOUNT RATE 6%	PV OF INFLOWS
1	$1,000,000	$700,000	.9434	$660,400
2	0	200,000	.8900	178,400
3	0	200,000	.8396	167,900
4	0	100,000	.7921	79,200
	$1,000,000	$1,200,000		$1,085,500

Project A has a net present value of $85,500. Its internal rate of return is calculated at 11.3%.

Project B

YEARS	OUTLAYS	INFLOWS	DISCOUNT RATE 6%	PV OF INFLOWS
1	$1,000,000	$100,000	.9434	$94,300
2	0	200,000	.8900	178,000
3	0	700,000	.8396	587,700
4	0	320,000	.7921	253,500
	$1,000,000	$1,320,000		$1,113,500

Project B has a net present value of $113,500. Its internal rate of return is calculated at 10.0%.

B offers $38,000 in additional net present value over Project A.

In the case illustrated in Table 2, if the discount rate was 8.26 percent, the NPV of the two projects would come to the same amount – $47,661. However, if the discount rate goes past 8.26 percent (but is less than 11.7 percent), the present value of X will exceed Y. This involves no paradox; it simply means that when the cost of capital is high, earlier returns are preferred over later returns (because capital is relatively scarce and very productive), and the present value of Project A will exceed that of B.

Sometimes the argument is made that the comparison need not be made between projects A and B but that a whole investment strategy should be considered. Suppose the argument goes that X funds could be used in other projects, the returns for which show a higher present value than Y. Should not A be undertaken in preference to B? The answer is no. B is still preferable to A; X can be replaced by market supplied funds, which will be priced at the firm's cost of capital. The original argument is fallacious because it is based on a misuse of the concept of alternative or opportunity costs. In fact, the present value criterion is correct because it uses an objective measure in its calculations. The firm's cost of capital is a market-determined rate (modified by the firm's peculiarities), and it basically reflects the supply and demand for capital in the economy as a whole. Properly calculated, it is an opportunity cost; it is the rate the firm must pay to acquire additional new funds, and it is also the imputed value of the monies to stockholders should the firm elect to use the funds to repay some of its stockholders.

2.1 Difference in Project Size

Condition 2, in which the sizes of two projects differ, is illustrated in Table 3. Here, the smaller project, A, has the greater internal rate of return, but the larger project, B, has the higher net present value. This means that the size increment in Project B earns benefits at a rate higher than the cost of capital, even though there is an "averaging down" of the rate of return. A simple proof is to conceive of the bigger project in two parts, one of which (i.e., B-A) may be considered an increment to the smaller project. Since the incremental project has a positive NPV, it is a desirable or profitable addition. Here again, the criterion of net present value gives an unambiguous correct answer.

A simple intuitive example comparing rates of return to maximizing wealth is to consider two **exclusive** options, K and L. Option K requires a payment of $100 and will pay an assured return of $500 at the end of the year. Option L costs $1,000 and returns $2,000 at the end of year. The return on K is 500 percent, on L 100 percent. For any normal rate of interest and financing availability, L is far preferable. The extra return of $1,500 for an additional outlay of $900 makes L a more valuable choice than K.

Table 3. Comparison of Projects

Project	A	B
Cost	$1,000,000	$1,200,000
PV of Inflows at 6%	1,500,000	1,770,000
Internal Rate of Return	12.0%	11.5%
Benefits/Cost Ratio	1.5X	1.48X
Net Present Value	$500,000	$570,000

Consider the difference between A and B as an independent project, B-A

Project	B-A
Cost	$200,000
PV of Inflows at 6%	270,000
Internal Rate of Return	9.0%
Benefits/Cost Ratio	1.35
Net Present Value	$70,000

One rating criterion often suggested is the benefit/cost ratio; i.e., the present value of the benefits divided by the cost of the project. However, as shown in Table 3, where the benefit/cost ratio favors Project A, this ratio is misleading when the projects differ in size. In fact, the optimal project size is reached when dPV /dI = 1, or when the discounted increase in inflows equals the marginal increase in the cost of the project. The proper criteria does not maximize the benefit/ cost ratio; it does maximize net present value or total wealth.

2.2 Differing Duration of the Inflows

The third condition, differing duration of the investment benefits, is a problem when the competing investment projects are renewable. If the projects are once-and-done activities, the one with the highest net present value is preferable. However, when the substitutable projects are renewable, not only may their internal rates of return differ but a net present value of, say, $100,000 for a stream of benefits lasting 5 years cannot be compared directly to the net present value of $120,000 for an alternate project of 7 years' duration. The problem involves a comparison of different strategies carried out over time, not merely a comparison of the return on the initial investments. The evaluation of strategies may not be very difficult if it can be assumed that each project could be renewed at the end of its life at similar costs and benefits as the present project. In this case, the net present values of each project can be annualized – reconverted into an equivalent flat annual amount over the life of each project. This is done by dividing the net present values by the present value annuity formula at the appropriate rate to yield the uniform annual equivalent return (UAER). The UAER amounts then can be compared directly. Table 4 illustrates such a problem. Here, although the NPV of Project B is larger, the equivalent annuity of Project A (at 10.0 percent) is $18,450 per annum; the equivalent annuity of B is $17,040 per annum. Thus, a series of A projects is preferred to one of B projects since it results in a higher stream of net benefits over time.

It might be noted at this point that, if the cost of capital (discount rate) should drop below 6.8 percent, Project B yields the greater annualized return and should be selected. This conforms to the basic rule that lower interest rates favor more capital intensive and longer-run projects.

Table 4. Comparison of Projects when Durations Differ
(Using the Method of Annualization)

Project A

Year	Outlay	Returns	Disc. Factor (at 10.0%)	Present Value
1	80,000	60,000	.909	54,540
2		50,000	.826	41,300
3		40,000	.751	30,040
	80,000			125,880

NPV = \$125,880 – 80,000 = \$45,880
Equivalent annual stream of return for three years at 10% = \$18,450.

Project B

Year	Outlay	Returns	Disc. Factor (at 10.0%)	Present Value
1	\$170,000	80,000	.909	72,720
2		70,000	.826	57,820
3		60,000	.751	45,060
4		50,000	.683	34,150
5		40,000	.621	24,840
	\$170,000			\$234,590

NPV = \$234,590 - \$170,000 = \$64,590
Equivalent annual stream of return for five years at 10% = \$17,040

In the case in which the future renewal costs and benefits of each project may not be exact replicas of the original projects, annualization will not work. The solution must be obtained by comparing the net present value of a series of linked, shorter-lived projects to the net present value of an alternate series of longer projects, both ending at a reasonably common time. Thus, if capital Project A lasts 4 years and rival Project B lasts 6 years, a comparison of the net present value of three A-type projects with forecasted costs and benefits renewed at the end of 4 years and 8 years, respectively, should be made with the net present value of two linked type B projects also lasting a total of 12 years. Forecasting costs and returns accurately is difficult, but the calculation itself is not so hard. Thus, if:

I = the project cost at each renewal period
CF = benefits for each time period
r = cost of capital (discount rate)
NPV = net present value

then:

$$1.\ NPV_A = -I_{A_1} + \frac{b_1}{(1+r)} + \ldots + \frac{b_4}{(1+r)^4} - \frac{I_{A4}}{(1+r)^4}$$
$$+ \frac{b_8}{(1+r)^8} + \ldots + \frac{b_8}{(1+r)^8} - \frac{I_{A8}}{(1+r)^8}$$
$$+ \frac{b_8}{(1+r)^8} + \ldots + \frac{b_{12}}{(1+r)^{12}}.$$

$$2.\ NPV_B = -I_{B_1} + \frac{CF_1}{(1+r)} + \ldots + \frac{CF_8}{(1+r)^8} - \frac{I_{B8}}{(1+r)^8}$$
$$+ \frac{CF_7}{(1+r)^7} + \ldots + \frac{CF_{12}}{(1+r)^{12}}.$$

The forecasted costs of renewing each project when the time comes, and estimates of the extended benefits must be made specific. Then NPV A may be compared with NPVB to see which is larger.

3. LOWEST ANNUALIZED TOTAL COSTS

The annualization method comes into play in a variant problem where the benefits are a given and the question involves choosing the equipment or technique that shows the minimum cost. For example, suppose one piece of equipment has a lower initial cost but higher projected annual operating costs than an alternative which has a higher initial purchase price but lower projected ongoing operating and maintenance costs. The choice is made by taking the present value of the operating costs in each case and adding it to the purchase price. This total is then divided by the present value of the appropriate annuity factor to obtain the uniform annual equivalent cost (UAEC). The choice goes to the equipment showing the lowest UAEC.

4. THE IRRATIONAL FIXED CAPITAL BUDGET

As noted previously, in some circumstances, the decision makers are forced to choose between projects because they are faced with a fixed capital investment budget. It should be noted before proceeding, that an arbitrary fixed budget constraint is basically irrational. Presumably an operating, viable corporation can acquire funds at an appropriate cost of capital, just as it can buy or hire any other productive factor. The proper capital budget is flexible and not fixed. It is set at the amount of profitable investment opportunities within the purview of the firm. Instead of equating the amount of funds to be made available to the opportunities for profitable real investment, a fixed capital budget arbitrarily rations the amount of capital investment. Such a budget can result in uneconomic behavior; it can force the substitution of less efficient projects or delay the implementation of worthwhile improvements. Any economically desirable project that cannot be undertaken because of a limited budget represents a loss of an opportunity to create net wealth represents a loss of wealth.[3] In short, the planned outlays for capital projects, the capital budget, should not be fixed a priori; the so-called budget should be constructed after all projects, the costs and returns for which have been properly counted, are evaluated and passed upon. Presumably, if all projects are evaluated at the ongoing and obtainable cost of funds, the ideal procedure is to enlarge the budget to accommodate all worthwhile noncompeting projects.

5. OPERATING PRACTICE AND THE INTERNAL RATE OF RETURN

In operating practice it may be well to show decision makers both the results of the net present value criteria and the internal rate of return in order to demonstrate that the return on a feasible project having a positive net present value is above the cost of capital. Nevertheless, the optimum decision must go to the project showing the higher net present value. The internal rate of return is a ratio; a higher ratio is not the proper choice when it forecloses a project that has a higher absolute addition of wealth over cost. Essentially, the objective of capital choice is to maximize total wealth or value rather than the rate of return.

6. ACCOUNT FOR WORKING CAPITAL

A sound capital budgeting takes into account required increments to net working capital, additions to current assets in excess of current liabilities and annual incremental capital expenditures. Let us assume that we can introduce a new machine that costs $30 MM, which will produce a new product, producing sales in its initial year of production of $17.5 MM, and a 5 percent annual sales growth in sales during the 8-year life of the asset. These are several costs associated with the machine. Fixed costs, costs incurred regardless of production, will total $1.0 MM and variable costs, such as materials, are estimated to be 65 percent of sales. Depreciation will be charged as allowed during a seven-year life by the Accelerated Cost Recovery System, ACRS, reported in Chapter 3. Earnings before interest and taxes, EBIT, are found by Sales-Variable Costs-Fixed Costs-Depreciation. Taxes are paid at the incremental tax rate of 35 percent. The change in net working capital, dNWK, are $85,000 in year 1 and 10 percent of the change in sales, thereafter, and annual capital expenditures, CE, are $950,000 in year 1 and 15 percent of the change in sales, thereafter. The project operating cash flow is the machine's net income plus depreciation, and the machine's cash flow is its operating cash flow less its change in net working capital and its capital expenditures. The machine (project) discounted cash flow is discounted at a 10 percent cost of capital. The machine's Present Value, NPV, is $27.58 MM, which is less than its $30 MM cost.

	Year							
	1	2	3	4	5	6	7	8
Sales	17500000	18375000	19293750	20258438	21271359	22334927	23451674	24624257
Variable Costs	11375000	11943750	12540938	13167984	13826384	14517703	15243588	16005767
Fixed Costs	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Depreciation	4287000	7347000	5247000	3747000	2679000	2679000	2679000	1335000
EBIT	838000	-1915750	505813	2343453	3765976	4138225	4529086	6283490
Taxes	293300	-670513	177034	820209	1318092	1448379	1585180	2199222
Net Income	544700	-1245238	328778	1523245	2447884	2689846	2943906	4084269
dNWK	85000	87500	91875	96469	101292	106357	111675	117258
CE	95000	131250	137813	144703	151938	159535	167512	175888
Project Op. CF	4831700	6101763	5575778	5270245	5126884	5368846	5622906	5419269
Project CF	4651700	5883013	5346091	5029073	4873654	5102954	5343719	5126123
Disct CF	4228860	4855839	4016518	3434857	3026052	2880618	2742397	2391336
PV(CF)	27576476							
Costs	30000000							
NPV (CF)	-2423524							

The machine's Net Present Value, its PV less the cost, is -2.42 MM. The new machine should not be purchased because its NPV is negative.

7. REAL INVESTMENTS AND THE COST OF FUNDS

The problem central to a firm's long-run financial policy is the selection of investment projects – that is, the choice of business projects based on the likely return compared to the cost of the funds needed to finance them. The theoretical concept for determining the desirability or profitability of a project does not entail any difficulties. In application, however, it may involve fairly complicated calculations.

The relation between the firm's cost of funds and the return from the earnings opportunities open to it is the major determinant of the success of the company. If the company can consistently apply funds to its operations at a rate of return above the cost of the funds used, it is considered a growth firm, and the owners of the common equity will experience financial happiness. In any case, as long as the management of the corporation does not regularly invest funds at a return lower than their costs – or consistently overlook profitable investment opportunities – the management must be deemed a success.

8. APPLYING INVESTMENT THEORY

The application of investment theory requires the decision makers to insert numerical estimates into the equations:

$$PV = \frac{CF_1}{(1+i)} + \frac{CFn}{(1+i)^n} + \frac{Sn}{(1+i)^n} \tag{3}$$

$$\text{NPV} = \text{PV} - \text{I}$$

All the variables are subject to some degree of uncertainty in the calculation.

CFs the forecasted periodic estimated benefits. In the case of a pure business operation, the usual problem involves the calculation of the net after tax cash flow of the project. Sometimes a project, e.g., a recreation area for the employees, has no cash inflow but is estimated to yield benefits in terms of increased employee morale and employee improved retention rates. CF for each period is an estimate of some reasonable amount that the firm might pay for these beneficial improvements. If the project is a business operation, than CF is the periodic net after tax cash flow the investment is forecasted to yield. This involves a forecast of the gross cash revenues minus the estimated out-of-pocket operating costs. These costs do not include economic depreciation which is implicit in the fact that n, the life of the project is finite. The amount of depreciation allowable under the tax code is used to calculate the amount of cash flow subject to tax. The amount of tax, not the depreciation, is then subtracted to obtain the after-tax cash flow. The project should bear a share of managerial costs in-so-far as management costs increase with the volume of operations and presumably decrease with a cutback.

S is the forecasted scrap or withdrawal value of the project at the end of its economic life. *S* can include current or working capital no longer required when the operation ceases. *S* need not be a positive amount. It can be a negative amount if there are to be clean up or demolition costs; on the other hand, there may be recoverable land value.

The estimated economic life of the investment in the project. The decision maker needs to make a forecast as to when machinery or buildings will wear out and maintenance costs become excessive or when obsolesce could require the substitution of new technology. However, because of the effect of discounting mistakes in estimating n are inconsequential when the forecast for n is a long period.

The appropriate discount rate used to discount the inflows in order to obtain PV, the present value of the project is depicted as i. For a project falling within the normal purview of the firm, the ideal discount rate is the weighted after-tax cost of the components making up the optimal financial structure for the firm. (An after-tax cost is employed because CF, the cash inflow, has been calculated on an after-tax basis.) Various adjustments are suggested where the level of risk differs from that of the usual operation.

I is the total investment outlay on the project. The investment on the project includes all the machinery, fixtures, and construction costs. It should include the imputed value of land costs. *I* should include working capital assets, cash needs and working inventory, that will be required by the project. If the project requires time to complete, a periodic charge at the cost of capital rate should be added to the investment cost of project. If projected initial operating returns are negative, show operating losses before the project gets "on line," these start up costs should be added to the total investment.

The investment, I, is subtracted from PV, the present value of the inflows, to obtain NPV, the net present value of the project. If NPV is zero, the project is expected to generate a normal rate of return, one that will satisfy all the investors in the firm. If NPV is positive, the return is better than the norm; extra profits rebound to the shareholders. If investment, I exceeds PV, then the project does not cover the costs of capital.

Illustration of an Investment Decision, ABC, Inc.

Financial Structure

	Normal Financial Structure Percent of Total Assets	Pre-tax Cost Current Market	After-tax Cost (Tax Rate 35%)	Weighted After-tax Cost of K_0
Current Liability	30%	5.0%	3.25%	0.98%
L.T. Debt	30%	8.33%	5.42%	1.63%
Equity	40%	15.0% (desired pre-tax rate of return)	10.50%	4.20%
				Total 6.81%

The project requires an outlay of \$300,000 in fixed assets and \$200,000 in gross working capital (i.e., current assets). That is, investment, I equals \$500,000.[4] \$180,000 of the current assets will be available to the firm after the project ends in four years. The fixed assets will be worthless. The tax rate is 35%.

Year	Before Tax Cash Flow in Excess of Operating Costs	ACRS Depreciation Expenses	Effective Taxes (35%)	After Tax Cash Flow	Discount Factor (k=.0681)	P.V.
1	\$120,000	\$99,990	42,000	\$177,990	.9363	\$166,652
2	280,000	133,350	98,000	315,350	.8767	276,467
3	300,000	44,430	105,000	239,430	.8209	196,549
4	100,000	22,230	22,230	100,000	.7686	76,860
4a	180,000*			180,000	.7686	138,348
	Total PV					\$854,876

* Return of working capital

NPV = \$854,876 minus \$500,000 or \$354,876.

The project is worthwhile because its NPV exceeds zero.

Myers (1974) has suggested that the adjusted present-value model (APV) be considered relative to the weighted average cost of capital (WACC). In the APV approach, project cash flows are broken down into unleveraged, operating cash flow, and cash flow associated with financing the project. Different discount rates can be used to reflect the present value of the tax shield on debt used to finance the project. The reader is reminded that we discussed this tax shield on debt in Chapter 10.

8.1 CFO Practice

In their survey of 392 Chief Financial Officers (CFOs), Graham and Harvey (2001) found that approximately 76 percent of the CFOs almost always used internal rate of return and net present value calculations in project or acquisition decisions. These decisions are well grounded in the financial decisions previously discussed. Graham and Harvey (2001) also found that approximately 57 percent of the CFOs surveyed used payback period and hurdle rate calculations. The payback period and hurdle rate calculations were the third and fourth methods, respectively, of analyzing projects. Adjusted present value and the profitability index, the latter being optimal for capital rationing, or a fixed capital budget, were the least used techniques. Let us discuss the payback period. The payback period is the ratio of the cost of capital investment divided by its annual earnings before depreciation [Gordon (1955)]. The payback period gives equal weight to the cash flow before the payback period, or "cut off date," and ignores all cash flow after the cut off date [Brealey and Myers (2003)].[5] The hurdle rate is a minimum acceptable rate of return established by management. It is generally higher than the firm's cost of capital [Lerner and Carleton (1966)].

8.2 Current Costs of the "Optimum" Financial Mix

For normal projects falling within the regular operations of the firm the basic discount rate employs the cost of the financial mix which appears optimum for the type of firm. This involves some qualitative judgments as to the long-run reaction of the financial and investment market to financial risk. The analyst must estimate the amount of debt of all types the firm can safely and profitably carry, given the typical nature of its operations and of its asset structure. An important feature of this approach is its attempt to take into account the "full cost" of capital, including costs which may not be immediately explicit. If, for example, the firm already has a large equity base, it may be able to borrow at a relatively low rate to finance new operations. To assume that the cost of capital for the new projects is merely the external interest rate is to fail to account properly for the implicit costs of the "extra" equity capital already existing in the firm. Although a new project might be financed by debt to bring the firm's financial structure into balance, the firm must consider the full imputed costs of its capital mix. A given project is not burdened or credited with just the cost of its particular financial source, but with the costs of the overall "optimum" capital costs for the firm.

9. ADJUSTING THE CAPITAL MIX AND COSTS FOR INDIVIDUAL PROJECT

A rather subtle but perhaps useful concept in getting at the cost of capital for a particular project is to consider it, if it is large enough, as a financial entity. Potential projects differ not only in their forecasted rate of return but also in the certainties of the forecast and the possibilities of asset losses. Thus risky projects implicitly require heavier admixtures of relatively expensive equity capital (in a non-M&M world), whereas less risky ventures can be financed more heavily with cheaper debt. This approach furnishes one method of dealing with risk; the more risky projects are discounted at a higher rate before they are accepted.

If in actuality as the firm expands it could adjust its financing to the type of projects it undertakes, the capital structure will change over time. Such a policy slowly but continually moves the firm's financial structure into line with the type of enterprise, product, operations, and assets it currently maintains.

10. CLOSING OR CONTINUING OPERATIONS

A difficulty may arise in calculating the desirability of additional investment in projects or areas already in operation. In some circumstances, outlays for the purpose of preventing a fall in earnings may be profitable. The difference in the forecasted flow of earnings with the project and without the project is the implied earnings of the investment. If, however, the mistake is made of setting the investment at just the cost of the additional assets, the rate of return will be grossly exaggerated. Properly, the amount of the investment is the sum of the new assets plus the liquidation or withdrawal value of the assets presently used in the operation. For example, a firm may contemplate additional outlays in a sector of its operations, not with the hope of increased returns but to prevent deterioration in its competitive position. The value of the losses forestalled may appear high compared to the cost of the additional assets. Yet the firm has another alternative, to withdraw entirely from this area of its activities. The salvage value of the existing investment plus the cost of the new assets must be compared to the present value of the flow of funds forecasted from the operation.[6] Only if the return is large enough on this basis should the operation be continued.[7]

On the other hand, the recoverable value of assets already committed to a given line of production is usually quite low; this furnishes one explanation why firms often continue to invest in activities whose return is stable or declining. (The return on the sum of the new repair and maintenance assets plus the low liquidation value of the old assets may be relatively good.) Thus economically it may be difficult for a firm to withdraw from a going operation.

11. STABILITY OF FORECASTS-RISK OF THE INVESTMENT

The level of the cash flow, CF, an investment is expected to bring in over the years is an estimate or forecast. In some cases the net cash flow can be estimated with more confidence than in others. For example, the cash flow generated-by a cost savings project usually can be estimated with more certainty than a project directed to expanding output. The projected return over out-of-pocket cost is likely to be more accurate on the expansion of the output of an old product than on the introduction of a new item, and the funds flow can be forecasted more reliably for a product with a stable demand than for one subject to high style or income change volatility or price uncertainty.

For different types of projects, the estimated profitability on forecasts is more problematical in some instances than others. The dispersion of the probability outcome of the rates of return for different kinds of company investments is one aspect of the varying level of risk of different projects. Thus, suppose project A is likely to return something between 10 to 16 per cent over its life with an expected mean return of 13 per cent; project B has the same expected return of 13 per cent but the range of probable outcomes is between -2 and 28 per cent. Project A is less risky and, other things, being equal, is preferred; possibly another way of putting it is that it can be financed with a more risky – i.e., less costly – financial mix.

Another aspect of risk is the fixity or specialization of the assets that must be committed to the project. A project requiring an investment mostly in current assets can be salvaged (if it seems desirable) with less loss than a project requiring mainly an investment in new or remodeled plant. Similarly, an investment in automotive equipment can be withdrawn with less loss than the funds put into fixtures or into a specialized piece of machinery. To make intelligent decisions on investment of the corporation's funds, the management should have not only the estimates on the rate of return, but also the possible range of the rate of return, and estimates of the maximum possible loss.

12. THE THEORY OF DEALING WITH RISK

For the typical project, the analysis usually presents a single-point forecast or estimates of the future cash flows and the projected expenditures, and then applies the given cost of funds, to decide whether the project is financially worthwhile. For a large number of usual business investment decisions, the element of uncertainty is not a major factor because problems that are likely to arise in the usual course of operations are included in the forecasts, and the use of a normal cost of funds as the discount rate seems reasonable.

Theory still leaves considerable difficulty providing solutions to problems which involve large factors of risk or uncertainty in the forecast of future benefits, in the stream of estimated future costs, or in the estimate of the full cost of the total outlay required to implement the project. In general, the extant literature on how to handle inordinate risk leaves us with a considerable degree of uncertainty.

12.1 Risk-Adjusted Discount Rate

For some projects for which the range and duration of future cash flows are difficult to forecast, it has been suggested that an extra premium sufficient to offset the disutility of the hazards inherent in the project be added to the normal discount rate. For example, if the decision makers would be content in the usual case with an overall 10.0 percent return, they are asked to evaluate the project with a risk-adjusted rate of 20.0 percent. Thus, a higher-than-normal expected return is required for acceptance of a risky project. It has, however, been pointed out that the increased discount rate places a proportionately greater value on near returns and severely devalues later inflows. It clearly favors shorter-run projects over longer-run projects, even though the degree of uncertainty may be the same.

However, it could be argued that in circumstances where the level of future operating costs, future demand, or the potential development of competitive goods are hard to predict, or when there is a great possibility of natural hazards or political instability, the length of time needed to recoup the investment is the essence of the risk. In these cases, for example, a project in a less then stable foreign country political environment, the risk-adjusted discount rate performs quite well.

12.2 Risk/Return Distribution

The risk versus the potential return on a potential investment is sometimes presented in a mathematical or graphical form in order to arrive at a decision. Figure 2 shows the risk return profile of two projects, A and B. The probabilities of the different return outcomes are not scientific probabilities derived from frequency observations but a priori probabilities derived from the best estimates of experience in these types of activities. Project A has a higher expected return than B, but it has much greater variance and a much larger possibility of coming in as at a loss. The expected return for B is relatively low, but the range of possible outcomes is quite constrained, and there is only a slight probability of loss. If B's expected return is minimally above the risk-free rate of return, there should be no difficulty in finding takers. On the other hand, even though project A has the possibility of being highly profitable, it appears to have a high level of risk. Whether it is implemented or not depends on the utility characteristics of the management, how strongly they evaluate high potential returns, and how willing and able they are to absorb any potential losses.

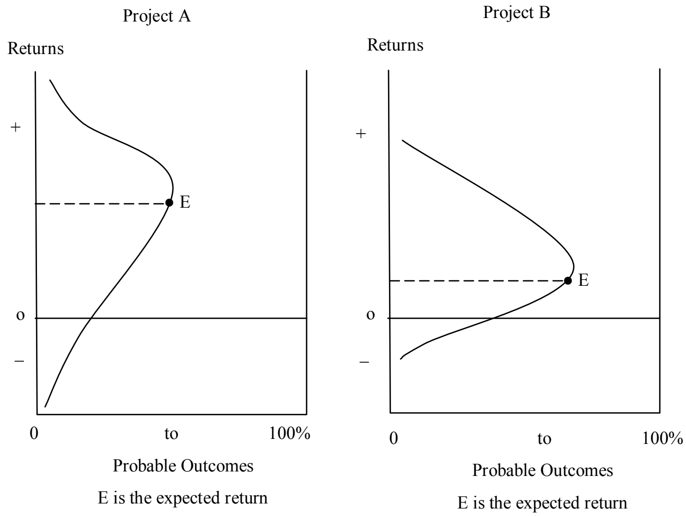

Figure 2. Risk/Return Profile of Two Projects

This discussion of variance is pertinent to the case in which the systematic risk of the projects is not much different than that of the rest of economy (i.e., covariance is close to 1.0). However, according to portfolio theory, a project that has a large variance which runs in an opposite direction than most of the rest of the economy serves the function of a hedge and may find willing takers. The cost of equity may be calculated using the required rate of return from the Capital Asset Pricing Model, which is introduced in Chapter 14.

12.3 Certainty Equivalence

Another suggested method of handling risk is to set up or forecast the range of each periodic benefit or return. The decision maker is then asked to search his psyche (his utility function) and select a certain return for which he would be willing to trade the possible projected outcome. (This return is, of course, lower than the mean expected periodic returns on the project.) These certainty equivalent returns are then discounted by a nonrisk cost of capital to see whether the net present value calculated on this basis are profitable and the project worthwhile.

The certainty equivalence model furnishes some revealing insights on how individual utility preferences and risk aversion might enter into the investment decision. The inherent problem is that one model does not have an external market guide but relies on the decision maker's psychological evaluation to frame the problem.

12.4 Maximum Loss and Reversibility

In dealing with risk, an important variable often left out of the discussion is the maximum possible loss. The maximum possible loss is related to the type of assets that must be committed to the project in case the investment needs to be liquidated. An investment that requires highly specialized, immobile assets (e.g., specific capital equipment and structures) which cannot be readily redirected to other uses will show a high maximum loss if operations prove unsuccessful. (Stated somewhat differently, investments in long-term, specialized assets are not readily reversible.) Outlays using skilled labor, research, development, and scientific testing are not likely to be recoverable if the outcome proves unusable. (However, the investment in training in skills may be turned to other uses in time.)

An investment with asset requirements that are mainly non-specialized, standardized items, small unit flexible capital equipment or inventory that may be readily marketable (albeit with some loss) is not as risky in terms of termination costs. In order to make an informed decision, the decision maker needs in addition to the range of possible outcomes, some estimate of the maximum loss in case the project is to be liquidated.

12.5 Gross Uncertainty

There are some ventures for which the gross payoff in case of success is simply tremendous. The potential returns are not truly calculable in percentages but in multiples of the original investment. Using interest or capital theory analysis in such a case is an exercise in pedantry. The present value of any successful outcome is simply off the board. Decision making in these areas is a matter of weighing the odds; it is essentially a problem in game theory. The psychology of the decision makers, their talents and judgment shape the decision.

12.6 Market Risk

We will discuss the development of market, or systematic risk, in Chapter 14. Management can estimate the security beta to use in calculating a cost of equity and capital. We illustrate the calculation of costs of equity and capital using the Capital Asset Pricing Model beta in Chapter 18 and value the estimated cash flow of a potential merger candidate. The discounted cash flow approach to merger valuation is an important example of the valuation technique employed in this chapter.

12.7 The Effect of Taxes on the Financial Structure

A corporate tax system that allows the deduction of interest on debt but taxes the return to the stockholders encourages the use of debt financing or leverage. An illustration of this effect, under the assumption of a defined optimal financial mix, is shown in Table 5. In a non-tax world, the optimal financial mix would be at line 3, (60% equity, 40% debt) with the lowest weighted capital costs, 12.15% to be applied to *nontaxable* profits. Under a 34.0 percent tax rate on equity profits, the optimum financial mix shifts to line 5, (60% debt and 40% equity), showing a cost of capital 10.45% to be applied however to the after tax cash flow. The example presented illustrates the existence of an optimal financial mix. Presumably in a theoretical frictionless, M&M world, the introduction of taxes would lead to a corner solution, with the lowest amount of equity possible as the optimum.

12.8 Costing the Components of the Financial Mix

In evaluating a project, the decision maker will employ an overall cost of capital. But arriving at this figure requires an understanding and a casting of the components going into the financial mix. The financial includes all the sources used to acquire and support all the assets employed by the firm.

Table 5. Effect of the Corporate Income Tax on the Optimum Financial Structure of the Firm

Overall Financial Mix		Percent of Each	Pre-tax Cost (Investors' Desired Rate-of-Return or Current Cost)	Adjusted After-Tax Cost (Assume 34% Tax Rate)	Weighted Cost of Capital (Assuming to Corp. Tax)	After-Tax Weighted Cost of Capital (Used to Discount After-Tax Cash Flows
1)	Total Debt	20.0%	9.00%	5.94%	1.80%	1.19%
	Equity	80.0%	13.25%	13.25%	10.60%	10.60%
	Total Weighted Cost				12.40%	11.79%
2)	Total Debt	30.0%	9.25%	6.11%	2.78%	1.83%
	Equity	70.0%	13.50%	13.50%	9.45%	9.45%
	Total Weighted Cost				12.23%	11.28%
3)	Total Debt	40.0%	9.75%	6.44%	3.90%	2.57%
	Equity	60.0%	13.75%	13.75%	8.25%	8.25%
	Total Weighted Cost				12.15%*	10.82%
4)	Total Debt	50.0%	10.75%	7.10%	5.38%	3.55%
	Equity	50.0%	14.00%	14.00%	7.00%	7.00%
	Total Weighted Cost				12.38%	10.55%
5)	Total Debt	60.0%	12.00%	7.92%	7.20%	4.75%
	Equity	40.0%	14.25%	14.25%	5.70%	5.70%
	Total Weighted Cost				12.90%	10.45%**
6)	Total Debt	70.0%	13.75%	9.08%	9.63%	6.35%
	Equity	30.0%	16.78%	16.78%	5.03%	5.03%
	Total Weighted Cost				14.66%	11.39%

*Least costly financial mix without taxes
** Least costly financial mix after accounting for tax effect

12.9 Cost of Trade Credit

If the firm pays its trade creditors within the cash discount period, the cost of the credit is zero to the firm which obtains it.[8] There is a cost if the accounts are not paid within the allotted time, i.e., the loss of the discount. The supply of trade or book credit is not unlimited; the sellers ration it. In addition, the use of excessive book credit strains the debtor firm's liquidity position.

12.10 Cost of Bank Credit

Bank credit may be needed only seasonally to help finance peak operations. Its cost can be charged in at its estimated average annual use multiplied by the going interest rate on bank loans. Since the rate of return on the project has been calculated after taxes, and interest is tax deductible, the cost of loan capital to the firm can be lowered by the reduction in the tax bill. If the tax rate is approximately 35 per cent, then a bank loan at 5 per cent costs the firm only 3.25 percent net.

12.11 Cost of Long-Term Debt

The cost of various long-term loans (bonds, debentures, subordinated debt, etc.) are averaged into the overall cost at their relative weights in the financial mix multiplied by their current market interest rates. The current rate of interest is the one that must be considered. The company may have bonds outstanding bearing a 5% per cent coupon rate, but if similar new bonds cannot be floated today at less than 7% per cent, the cost of debt capital is 7% per cent. The final after tax cost of long-term debt capital is reduced by the equivalent amount of tax saving.

12.12 Cost of Preferred Stock

Given an ongoing corporate profits tax, preferred stock is an expensive form of equity capital. It is generally used only because its subordinate position helps secure the safety of debt and thus lowers its cost. If preferred stock is employed as part of the capital mix, its cost to the firm is its current dividend yield. There is no tax saving on preferred, since its dividends are not considered a cost but a division of profits and come out after taxes are calculated.

12.13 Cost of Common Stock

The various uncertainties involved in the market evaluation of common shares make the costs of common equity funds the hardest to measure. A few guidelines help narrow the approximate range of these costs. The cost of common stock financing is based on its earnings yield and not its current dividend yield.

For normal stocks in a moderate market, the cost of equity capital may be approximated by the ratio $\frac{\text{earnings per share}}{\text{market price per share}}$, or the inverse of the traditional price/earnings ratio. The earnings used in the numerator must be a "normal" run of earnings. Neither the earnings per share of a poor year nor a boom year are appropriate.

The cost of equity funds is calculated on the market price of the shares. The amount earned on the book or asset value of the stock is of minor importance, since with passing of time the book value of the equity may diverge further and further from current economic realities and values.[9]

The earnings yield ratio is only a starting approximation of the cost of common stock financing. The current yield of a share on the market is influenced by the security markets' expectations and evaluation of the firm's future prospects. To get a usable cost of equity financing, the earnings yield has to be corrected for normal growth, potential recovery, forecasted decline, and super normal growth. In the case of normal sustainable growth, if the earnings yield on market is 6% (i.e., a P/E ratio of 16.6 times) and the sustainable growth rate of earnings is 4.0% per annum, the after tax desired return is 10.0%. When the market expects a potential recovery from a depressed period, the P/E ratio may appear quite high, e.g., 40 times or an earnings yield of 2½%. Here, the current yield may be ignored. The cost of equity financing is imputed from the market, i.e. the normal average return for the general run of stocks in the broad industry class. Chapter 14 further develops and estimates the return on equity by formally introducing the reader to the required rate of return on equity. The required rate of return on equity and the weighted average cost of capital are used to value a potential merger candidate in Chapter 18.

When the market expects a decline in a firms earnings, the current P/E ratio will be rather low, perhaps showing an earnings yield of 25%. Here again after allowing for variant risk (i.e. the beta function), the cost of equity capital has to be imputed from that prevailing on the market.

In the case of super normal growth, the firm may possess technological or marketing advantages which enable it to obtain earnings growth well over the norm, e.g., 15% to 20% per annum. The P/E may be as high (or higher) than 50 times earnings or 2% earnings yield. Of course, such a growth rate cannot be sustained indefinitely; as someone has remarked, over time a firm with such a growth rate would soon constitute the whole economy. The 2% earnings yield is not the true cost of equity; the investors would soon be extremely dissatisfied if the firm invested in projects that returned a mere 2%. Once again the cost of equity has to be imputed from the long run norm on the market.

A counter check to the earnings yield is to consider the earnings yield relative to the long run interest rate in a reasonably non-inflationary market. A risk premium of perhaps 4 to 6% might be added to the rate on top grade long term debt to obtain the cost of equity capital.

12.14 Internal Funds

The net internal funds available to the firm for additional investment constitute the money inflow for the period in excess of the costs of operations less interest, taxes, preferred stock dividends and required repayment of debt. Cash flow is a broad undifferentiated concept, nevertheless for purposes of exposition, we should divide the internal funds to those derived from earnings and those derived from true economic depreciation.

12.15 The Cost of Retained Earnings

Historically the cost of using retained earnings to help finance a firm has been the subject of considerable debate. Some writings in corporation finance seemed to imply that retained earnings were costless; the use of retained earnings in lieu of other sources of funds were sometimes given almost “moral” approval. Internal financing supposedly avoided the use of debt, prevented the firm from having to deal with bankers, or from having to appeal for new stockholders on the capital market. A careful reading of these arguments shows them to be mostly homiletical; they gave no guides as to the cost of using retained earnings in the firm, and no aid in deciding how much of a given flow of earnings may be reasonably kept and how much should be paid out in dividends or used for stock buy-backs.

A more scientific approach to the costing retained earnings is to impute to the retained funds their alternative or opportunity costs – that is, how much they could earn if they were paid out to the stockholders in dividends or in stock buybacks and reinvested in the best opportunities (of equal risk) available elsewhere. In effect, the firm should retain earnings only to the point where it can make a return on these funds equal to the normal market rate on equity funds. The cost of retained earnings should be imputed at the same rate as the normal return on shares of the same industry class. The general rule that retained earnings be given the imputed costs of equity is useful in solving the problem of capital cost, and it provides an answer to the problem of the amount of cash dividends or cash buybacks the firm should disperse and how much earnings it might retain. All cash earnings which cannot be employed at the proper rate of profit should be returned to the shareholders.

For the average firm in the economy, there is no shortage of internal funds. Overall the corporate sector generates a greater cash inflow rate then the growth of the economy. The aggregate inflow of cash exceeds the amount of economically feasible real investment and thus the corporate sector is a net exporter of cash to the rest of the economy.[10]

12.16 Other Internal Funds-Depreciation, Depletion, etc.

As a sort of "shorthand" method of expression, depreciation, depletion, amortization of intangible assets, etc., are commonly listed as sources of funds. But deeper analysis makes it clear that an excess of *revenues* over out of pocket *operating* costs is the only source of funds. Annual charges for depreciation and other such non cash charges are accounted as funds because reported accounting earnings are less than the total current funds flow. Depreciation, estimated amount of past capital dollar investment in fixed assets used up in the appropriate accounting period, is a charge against earnings but not against funds.

True economic depreciation based on the declining replacement value of the fixed assets represents a reemployment in the investment in capital. Funds arising from true economic depreciation carry the cost of the financial mix used to fund capital assets. In a theoretical sense these funds might be returned to the original investors in the capital assets. The cost of keeping them in the business is what could be saved by not paying off an equivalent amount of debt and equity. Insofar as new projects are financed with funds arising from true depreciation, these must be given the imputed costs of the suitable financial mix. Under the current tax code, the allowable depreciation deduction exceeds the amount of true economic depreciation. Funds arising from this source must be considered under a different rubric then true economic depreciation. These funds constitute a sort of deferred equity fund granted to the company by the taxing authority. The proper charge for these funds when retained in the business is the imputed cost of equity funds.

13. SUMMARY

A crucial problem in the management of a firm's capital is the selection of assets or projects whose estimated return will justify the cost of the funds invested in them. Although the details of the calculations vary, essentially projects are worthwhile when the cash inflow discounted at the appropriate cost of capital shows a present value equal or in excess of the original required investment. If the data underlying the calculation is correct, the project is estimated to have a return equal to or better than the cost of capital. Because the net cash flow on the project is a forecast and the required investment is an estimate, the actual profitability is also only a forecast; the project in operation may realize more or less.[11] Nevertheless, such an initial forecast and calculation of expected value is an essential step in real asset investment decision making.

If the management of a firm does its best in selecting assets and weighing their potential return against the cost of funds, then within the context of the prevailing economic conditions the best possible return will be maintained on the stockholders' investment without subjecting the firm to inordinate risk of failure.

Notes

[1]One needs to consider the case of Joel Dean's degree of necessity, in which projects must be undertaken regardless of their economic benefit (profit). Dean (1954) suggested that replacing a shop destroyed by fire could be an example of the degree of necessity, and he further suggested that you could not quantify the degree of necessity.

[2]The discounted cash flow approach has been widely accepted since Dean (1954).

[3]In a case of capital rationing, the profitability index is calculated and used. The profitability index is the project's net present value divided by its initial cost [Brealey and Myers (2003). (It is equivalent to the benefit cost ratio.)

[4]The ACRS depreciation charges for a three-year asset are 0.3363, 0.4445, 0.1481, and 0.0741, respectively.

[5]Gordon (1955) revealed that the payback period is proportional to the reciprocal of the project's rate of profit.

I	=	Cost of the project
E	=	Earnings or savings before depreciation of the project
n	=	Number of years of the project

s = Scrap value at time t = n
k = project's expected rate of profit.

$$C = \frac{E_1}{1+k} + \frac{E_2}{(1+k)^2} + \ldots + \frac{E_k}{a+k} + \frac{E_n + S_n}{(1+k)^n} \tag{4}$$

Gordon found if one ignored the scrap value, that:

$$\begin{aligned} C &= \sum_{t=1}^{n} \frac{S}{(a+k)^t} \\ &= \frac{S}{k} - \frac{S}{k}\left(1 + \frac{1}{(a+k)}\right)^n \end{aligned} \tag{5}$$

where (5) is the present value of an annuity

$$k = \frac{E}{C} - \frac{E}{C}\left(\frac{1}{1+k}\right)^n \tag{6}$$

As the life of the project becomes very large, equation (6) becomes

$$k = \frac{E}{C}$$

and the rate of profit is the reciprocal of the payback period. Furthermore, if the project life is infinite, then the rate of profit is the reciprocal of the payback period. The reader immediately recognizes the Gordon payback period analysis is consistent with the Gordon valuation of stock model shown in Chapter 8. If we buy a stock, we purchase a stream of expected future dividends. The stock price, P_{CS}, or P_0, is determined by the current dividends per share, D_0, and the growth rate of future dividends, g.

$$P_0 = \frac{D_0}{d-g}$$

where $k = \frac{D_0}{P_0 + g}$.

The rate of profits earned by purchasing stock is its current dividend yield, $\frac{D_0}{P_0}$, plus the rate at which dividends are expected to grow, as long as k >g [Gordon and Shapiro (1956)].

[6]If a firm does not make the proper cost-of-investment determination, it could develop an unprogressive policy in regard to equipment replacement. The firm could repair its equipment long past an economic optimum because the fairly large total earnings on a repaired piece of equipment is credited just to the costs of repair. The economic investment in a reconstruction job, however, is the repair costs plus the salvage value of the unrepaired equipment. Furthermore, the forecasted cash flow should subtract the estimate of maintenance costs that may still have to be made in the future. When the problem is thus properly formulated, it may be that a replacement will show a higher rate of return than a repair job.

[7]In a sense, the existence of the whole firm may be periodically measured against the same criterion: how does the withdrawal value of the firm's assets compare to the discounted value of its projected cash flow.

[8]The cost is not zero to the economy as a whole, but the individual firm is not concerned with aggregate economic costs at this point.

[9]The amount made on the asset value of the equity-especially its growth or trend over time-may, however, be a fairly good index of the firm's economic success.

[10]"The Corporate Sector: A Net Exporter of Funds," J.R. Aronson and E. Schwartz, *Southern Economic Journal*, October 1966.

[11]It should also be recognized that the accounting results and the estimated rate of return may not necessarily coincide because accounting conventions on depreciation and calculation of profits may differ from the assumptions underlying the cash-flow rate of return analysis. This need not invalidate the usefulness of either the discounted cash flow techniques or of accounting procedures.

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Problem

1. A firm is considering making an investment decision. Given the following data, should the firm purchase the investment, given its five-year-ahead cash flow valuation horizon? Please use straight line depreciation on the asset, and recover the working capital investment at the conclusion of the project.

   Acquiring Firm Data:
   Long-Term Debt is $20,000 MM,
   Stockholder Equity is 30,000 MM,
   The current risk-free rate is 1.87%,
   The relevant market risk premium is 8.8%,
   Firm beta is 1.45 (Value Line),
   Tax rate = 35%,
   and the AAA bond yield is 5.47 %

   Project Data:
   Project Cost $ 32,000,000
   Sales, 2004 $17,000,000
   Variable costs = .70*Sales,
   Fixed costs = $1,500,000,
   Tax rate = 35%,
   Change in Net Working Capital = .1*Change in Sales
   Capital Expenditures = .15*Change in Sales
   Initial Working Capital investment = $500,000
   Initial Capital Expenditures = $600,000.

Chapter 12

REGRESSION ANALYSIS AND FORECASTING MODELS

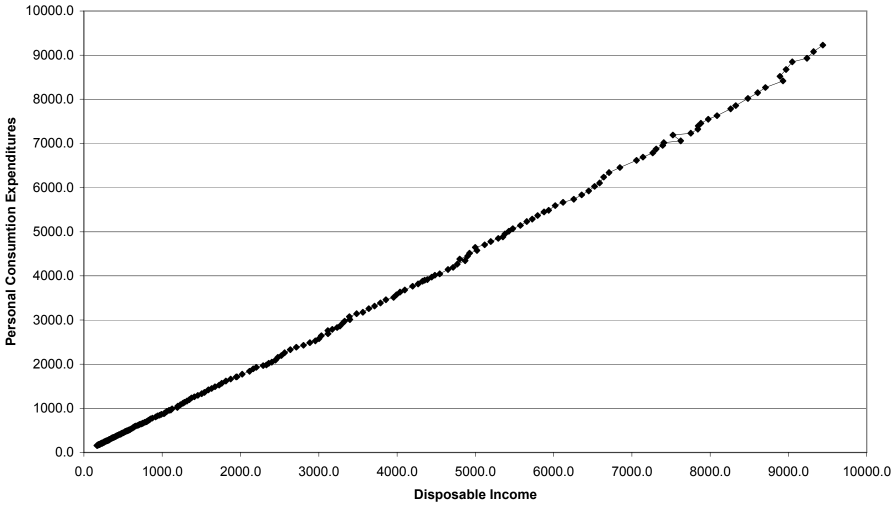
A forecast is merely a prediction about the future values of data. Financial forecasts span a broad range of areas, and each of the forecasts is of interest to a number of people and departments in a firm. A sales manager may wish to forecast sales (either in units sold or revenues generated). This prediction is of interest to the operations (manufacturing) department in order to predict the materials and time needed to create the product. The corporate financial officer is interested in the amount of cash required to support the projected level of sales and how much available cash inflow he can eventually expect to pay financial costs, cover expansion programs, and provide cash payouts to investors. In short, good forecasting underlies the construction of an operational cash budget.[1]

There are a number of ways to make forecasts. One could consult tarot cards or be guided solely by one's intuition. Recent years have seen the explicit search for "megatrends" which, presumably, might continue into the future. However, regression analysis, is the primarily techniques used in this chapter. Regression analysis is a preferred technique used to analyze quantitative data to make forecasts. As a brief introduction to regression analysis, consider the following graph.

The horizontal line is called the X axis and the vertical line the Y axis. Regression analysis looks for a relationship between the X variable (sometimes called the "independent" or "explanatory" variable) and the Y variable (the "dependent" variable). It has been held, since the time of John Maynard Keynes, the renowned British economist, that consumption is a function of disposable income [Klein (1965)]. If one goes to the database of the St. Louis Federal Reserve Bank, one can download quarterly data for the 1947 – 2006 period on personal consumption expenditures (PCEC) and disposable income, DPI. The data plot of the consumption and personal income data is shown in Exhibit 1.

More specifically, regression analysis seeks to find the "line of best fit" through the points. Basically, the regression line is drawn to best approximate the relationship between the two variables. It is obvious to the most causal observer that a straight line produces evidence of a strong association between consumption and disposable income. Techniques for estimating the regression line (i.e., its intercept on the Y axis and its slope) are the subject of this chapter.

Exhibit 1. U.S. Consumption Function Data, 1947-2006 ($ Billions)



Source: Federal Reserve Board Economic Data, Fred II.

Forecasts using the regression line assume that the relationship which existed in the past between the two variables will continue to exist in the future. There may be times when this assumption is inappropriate; the forecaster must be aware of this potential pitfall. Once the regression line has been estimated, the forecaster must provide an estimate of the future level of the independent variable. For example, if we were going to use the regression line in the graph above to forecast consumption in 2007, then we must first estimate what the level of personal disposable income will be in that year. We then plug this estimate into the regression equation. The output is our forecast of the sale of cars. The reader clearly sees that the forecast of the independent variable is paramount to an accurate forecast of the dependent variable.

Regression analysis can be expanded to include more than one independent variable. Regressions involving more than one independent variable are referred to as multiple regression analysis. For example, the forecaster might believe that the number of cars sold depends not only on personal disposable income but also on the level of interest rates. Historical data on these three variables must be obtained and a plane of best fit estimated. Given an estimate of the future level of personal disposable income and interest rates, one can make a forecast of car sales.

Regression capabilities are found in a wide variety of software packages and hence are available to anyone with a microcomputer. Lotus

1-2-3, a popular spreadsheet package, and SAS can do simple or multiple regressions. Many statistics packages can do not only regressions, but other quantitative techniques such as those discussed in Chapter 13 (Time Series Analysis and Forecasting).

The alert management of a firm can try to develop an accurate forecast of its future operations. The future may involve the next quarter, year, or five years. Sales is one of the most important variables to be forecast because the balance sheet and the income statements can be generated from a relationship to historic percentage-of-sales. When the firm has made a reasonable sales forecast, it will be able to prepare a projected pro forma income statement and balance sheet. The determination of sales and cash flow will aid the firm in its decision on how much to issue corporate liabilities. In chapter 13, we will employ regression analysis to forecast the firm's sales and thus derive its projected financial statements.

In simple regression analysis, one seeks to measure the statistical association between two variables, X and Y. Regression analysis is generally used to measure how changes in the independent variable, X, influence changes in the dependent variable, Y. Regression analysis shows a statistical association or correlation among variables, rather than a causal relationship among variables.

Simple linear least squares regression is a reasonable tool to use in the forecasting of sales. Least squares regression assumes the past is the proxy for the future. The sales of the firm in the future will be determined by the same variables and magnitudes of the variables' influence as those that have determined the sales of the past. When one uses regression analysis, one seeks to examine the statistical association between two variables, so one may forecast using the regression analysis only if the association remains reasonably stable. This is an assumption which, if violated, can make a forecast of sales look absurd. The failure to foresee an oil embargo or a change in Federal Reserve policy is a weakness of many economic models. Regression forecasts of a firm's sales are powerless against major economic catastrophes, nevertheless it can point a reasonable direction for the firm.

Once a sales forecast has been calculated, the manager must determine if any external funds need to be acquired from the capital market. An income statement and balance sheet can be derived from the sales figure using a percentage-of-sales method. The financial statements will indicate the firm's external funds needed. The rational manager will borrow funds from the capital market if it fits within his financial structure.

The case of simple, linear, least squares regression may be written in the form:

$$Y = \alpha + \beta X + \varepsilon \tag{1}$$

where Y, the dependent variable, is a linear function of X, the independent variable. The parameters α and β characterize the population regression line and ε is the randomly distributed error term. The regression estimates of α and β will be derived from the principal of least squares. In applying least squares, the sum of the squared regression errors will be minimized; our regression errors equal the actual dependent variable minus the estimated value from the regression line. If Y represents the actual value and Y the estimated value, their difference is the error term, *e*. Least squares regression minimized the sum of the squared error terms. The simple regression line will yield an estimated value of Y, $\hat{Y}$ by the use of the sample regression:

$$\hat{Y} = a + \beta X \tag{2}$$

In the estimation equation (2), a is the least squares estimate of α and b is the estimate of β. Thus, a and b are the regression constants that must be estimated. The least squares regression constants (or statistics) α and β are unbiased and efficient (smallest variance) estimators of α and β. The error term, e_i, is the difference between the actual and estimated dependent variable value for any given independent variable values, X_i.

$$e_i = \hat{Y}_i - Y_i \tag{3}$$

The regression error term, e_i, is the least squares estimate of ε_i, the actual error term.[2]

To minimize the error terms, the least squares technique minimizes the sum of the squares error terms of the N observations,

$$\sum_{i=1}^{N} e_i^2 \tag{4}$$

The error terms from the N observations will be minimized. Thus, least squares regression minimizes:

$$\sum_{i=1}^{N} e_i^2 = \sum_{i=1}^{N} [Y_i - \hat{Y}_i]^2 = \sum_{i=1}^{N} [Y_i - (\alpha + b X_i)]^2 \tag{5}$$

To assure that a minimum is reached, the partial derivatives of the squared error terms function

$$\sum_{i=1}^{N} = [Y_i - (\alpha + b\,X_i)]^2$$

will be taken with respect to *a* and *b*.

$$\frac{\partial \sum_{i=1}^{N} e_i^2}{\partial a} = 2\sum_{i=1}^{N} (Y_i - a - bX_i)(-1)$$

$$= -2\left(\sum_{i=1}^{N} Y_i - \sum_{i=1}^{N} a - b\sum_{i=1}^{N} X_i \right)$$

$$\frac{\partial \sum_{i=1}^{N} e_i^2}{\partial b} = 2\sum_{i=1}^{N} (Y_i - a - bX_i)(-Xi)$$

$$= -2\left(\sum_{i=1}^{N} Y_i X_i - \sum_{i=1}^{N} X_i - b\sum_{i=1}^{N} X_1^2 \right)$$

The partial derivatives will then be set equal to zero.

$$\frac{\partial \sum_{i=1}^{N} e_i^2}{\partial a} = -2\left(\sum_{i=1}^{N} Y_i - \sum_{i=1}^{N} a - b\sum_{i=1}^{N} X_i \right) = 0$$

$$\frac{\partial \sum_{i=1}^{N} e_i^2}{\partial b} = -2\left(\sum_{i=1}^{N} YX_i - \sum_{i=1}^{N} X_1 \text{ - } b\sum_{i=1}^{N} X_1^2 \right) = 0 \qquad (6)$$

Rewriting these equations, one obtains the normal equations:

$$\sum_{i=1}^{N} Y_i = \sum_{i=1}^{N} a + b\sum_{i=1}^{N} X_i$$

$$\sum_{i=1}^{N} Y_i X_i = a\sum_{i=1}^{N} X_i + b\sum_{i=1}^{N} X_1^2 \qquad (7)$$

Solving the normal equations simultaneously for a and b yields the least squares regression estimates;

$$\hat{a} = \frac{\left(\sum_{i=1}^{N} X_i^2\right)\left(\sum_{i=1}^{N} Y_i\right) - \left(\sum_{i=1}^{N} X_i Y_i\right)}{N\left(\sum_{i=1}^{N} X_i^2\right) - \left(\sum_{i=1}^{N} X_i\right)^2},$$

$$\hat{b} = \frac{\left(\sum_{i=1}^{N} X_i Y_i\right) - \left(\sum_{i=1}^{N} X_i\right)\left(\sum_{i=1}^{N} Y_i\right)}{N\left(\sum_{i=1}^{N} X_i^2\right) - \left(\sum_{i=1}^{N} X_i\right)^2}, \tag{8}$$

An estimation of the regression line's coefficients and goodness of fit also can be found in terms of expressing the dependent and independent variables in terms of deviations from their means, their sample moments. The sample moments will be denoted by M.

$$M_{XX} = \sum_{i=1}^{N} x_i^2 = \sum_{i=1}^{N} (x_i - \overline{x})^2$$

$$= N\sum_{i=1}^{N} X_i - \left(\sum_{i=1}^{N} X_i\right)^2$$

$$M_{XY} = \sum_{i=1}^{N} x_i y_i = \sum_{i=1}^{N} (X_i - \overline{X})(Y_i - \overline{Y})$$

$$= N\sum_{i=1}^{N} X_i Y_i - \left(\sum_{i=1}^{N} X_i\right)\left(\sum_{i=1}^{N} Y_i\right)$$

$$M_{YY} = \sum_{i=1}^{N} y_i^2 = \sum_{i=1}^{N} \left(Y - \overline{Y}\right)^2$$

$$= N\left(\sum_{i=1}^{N} Y_i^2\right) - \sum_{i=1}^{N} (Y_i)^2$$

The slope of the regression line, *b*, can be found by:

$$\hat{b} = \frac{M_{XY}}{M_{XX}} \tag{9}$$

$$\hat{a} = \frac{\sum_{i=1}^{N} Y_i}{N} - \hat{b}\frac{\sum_{i=1}^{N} X_i}{N} = \overline{y} - b\overline{X} \tag{10}$$

The standard error of the regression line can be found in terms of the sample moments.

$$S_e^2 = \frac{M_{XX}(M_{YY}) - (M_{XY})^2}{N(N-2)M_{XX}}$$

$$S_e = \sqrt{S_e^2} \tag{11}$$

The major benefit in calculating the sample moments is that the correlation coefficient, r, and the coefficient of determination, r^2, can easily be found.

$$r = \frac{M_{XY}}{(M_{XX})(M_{YY})}$$

$$R^2 = (r)^2 \tag{12}$$

The coefficient of determination, R^2, is the percentage of the variance of the dependent variable explained by the independent variable. The coefficient of determination cannot exceed 1 nor be less than zero. In the case of $R^2 = 0$, the regression line's Y = Y and no variation in the dependent variable is explained. If the dependent variable pattern continues as in the past, the model with time as the independent variable should be of good use in forecasting.

The firm can test whether the *a* and *b* coefficients are statistically different from zero, the generally accepted null hypothesis. A t-test is used to test the two null hypotheses:

$H_{0_1} : a = 0$

$H_{A_1} : a \text{ ne } 0$

$H_{0_2} : \beta = 0$

$H_{A_2} : \beta \text{ ne } 0$

where ne denotes not equal.

The *HO* represents the null hypothesis while *HA* represents the alternative hypothesis. To reject the null hypothesis, the calculated t-value must exceed the critical t-value given in the t-tables in the appendix. The calculated t-values for *a* and *b* are found by:

$$t_a = \frac{a - \alpha}{S_e} \sqrt{\frac{N(M_{XX})}{M_{XX} + (N\overline{X})^2}}$$

$$t_b = \frac{b - \beta}{S_e} \sqrt{\frac{(M_{XX})}{N}} \tag{13}$$

The critical t-value, t_c, for the .05 level of significance with N – 2 degrees of freedom, can be found in a t-table in any statistical econometric text. One has a statistically significant regression model if one can reject the null hypothesis of the estimated slope coefficient.

We can create 95 percent confidence intervals for *a* and *b*, where the limits of *a* and *b* are:

$$a + ta/_2\, S_e{}^{+} \sqrt{\frac{(N\overline{X})^2 + M_{XX}}{N(M_{XX})}} \tag{14}$$

$$b + ta/_2\, S_e \sqrt{\frac{N}{M_{XX}}}$$

To test whether the model is a useful model, an F-test is performed where:

$H_o = \alpha = \beta = 0$

$H_A = \alpha$ ne β ne 0

$$F = \frac{\sum_{i=1}^{N} Y^2 \div 1 - \beta^2 \sum_{i=1}^{N} X_i^2}{\sum_{i=1}^{N} e^2 \div N - 2} \tag{15}$$

As the calculated F-value exceeds the critical F-value with (1, N- 2) degrees of freedom of 5.99 at the .05 level of significance, the null hypothesis must be rejected. The 95 percent confidence level limit of prediction can be found in terms of the dependent variable value:

$$(a + bX_0) + t\alpha/_2\, S_e \sqrt{\frac{N(X_0 - \overline{X})^2}{1 + N + M_{XX}}} \tag{16}$$

If one estimates a least squares regression line using the data shown in Table 1, then one obtains an estimated slope of 0.94, with a corresponding t-statistic of 418.85. Consumption is highly correlated with disposable income. The F-statistic is 175439, and the adjusted R-squared is 0.9987. An inspectation of Exhibit 1 leads one to see the reasonableness of the linear model for the consumption data. What do we assume in estimating a least squares regression line to approximate a relationship? We assume the following:

1. A linear function is appropriate;
2. The variance is constant and known; it does not increase with time or the value of the independent variable;
3. The expected value of the error term is zero (unbiased);
4. The error terms are uncorrelated with one another.

Assumptions 2 and 3 imply that the disturbances, or error terms, are normally distributed [Greene (1997)].

1. AUTOCORRELATION

An estimated regression equation is plagued by the first-order correlation of residuals. That is, the regression error terms are not white noise (random) as is assumed in the general linear model, but are serially correlated where

$\varepsilon_t = \rho\varepsilon_{t=1} + U_t$ $\qquad t = 1,2,\dots N$ (17)

ε_t = regression error term at time t,

ρ = first-order correlation coefficient and

U_t = normally and independently distributed random variable.

The serial correlation of error terms, known as autocorrelation, is a violation of a regression assumption and may be corrected by the application of the Cochrane-Orcutt procedure.[3] Autocorrelation produces unbiased, the expected value of parameter is the population parameter, but inefficient parameters. The variances of the parameters are biased (too low) among the set of linear unbiased estimators and the sample t and F-statistics are too large. The Cochrane-Orcutt (CORC) procedure was developed to produce the best linear unbiased estimators (BLUE) given the autocorrelation of regression residuals. The CORC procedure uses the information implicit in the first-order correlative of residuals to produce unbiased and efficient estimators

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$
$$\hat{\rho} = \frac{\sum e_t, e_t - 1}{\sum e_t^2 - 1} \tag{18}$$

The dependent and independent variables are transformed by the estimated rho, $\hat{\rho}$, to obtain more efficient ordinary least squares estimates:

$$Y_t - \rho Y_{t-1} = \alpha(1 - \rho) + \beta(X_t - \rho X_{t-1}) + ut \tag{19}$$

The Cochrane-Orcutt procedure is an iterative procedure that can be repeated until the coefficients converge. One immediately recognizes that as ρ approaches unity the regression model approaches a first-difference model.

The Durbin- Watson, D-W, statistic was developed to test for the absence of autocorrelation:

H_o: $\rho = 0$

One generally tests for the presence of autocorrelation ($\rho = 0$) using the Durbin-Watson statistic:

$$D - W = d = \frac{\sum_{t=2}^{N} (e_t = e_{t-1})^2}{\sum_{t=2}^{N} e_t^2} \tag{20}$$

The e s represent the ordinary least squares regression residuals and a two-tailed tail is employed to examine the randomness of residuals. One rejects the null hypothesis of no statistically significant autocorrelation if:

$d < d_L$ or $d > 4 - d_u$

where

d_L is the “lower” Durbin-Watson level

and

d_u is the “upper” Durbin-Watson level.

The upper and lower level Durbin-Watson statistic levels are given in Johnston (1972). The Durbin-Watson statistic is used to test only for first-order correlation among residuals.

$$D = 2(1-\rho) \tag{21}$$

If the first-order correlation of model residuals is zero, the Durbin-Watson statistic is 2. A very low value of the Durbin-Watson statistic, $d < d_L$, indicates positive autocorrelation between residuals and produces a regression model that is not statistically plagued by autocorrelation.

The inconclusive range for the estimated Durbin-Watson statistic is $d_L < d < d_u$ or $4 - d_u < 4- d_u$. One does not reject the null hypothesis of no autocorrelation of residuals if $d_u < d < 4 - d_u$.

One of the weaknesses of the Durbin-Watson test for serial correlation is that only first-order autocorrelation of residuals is examined, one should plot the correlation of residual with various time lags corr (e_t, e_{t-k}) to identify higher-order correlations among residuals.

In a nonlinear least squares (NLLS) model, one seeks to estimate an equation in which the dependent variable increases by a constant growth rate rather than a constant amount.[4] The nonlinear regression equation is:

$$Y = ab^x \tag{22}$$

or $\log Y = \log a + \log BX$

The normal equations are derived from minimizing the sum of the squared error terms (as in ordinary least squares) and may be written as:

$$\begin{aligned} \Sigma(\log Y) &= N(\log a) + (\log b)\,\Sigma X \\ \Sigma(X \log Y) &= (\log a)\Sigma X + (\log b)\,\Sigma X^2 \end{aligned} \tag{23}$$

The solutions to the simplified NLLS estimation equation are:

$$\begin{aligned} \log a &= \frac{\Sigma(\log Y)}{N} \\ \log b &= \frac{\Sigma(X \log Y)}{\Sigma X^2} \end{aligned} \tag{25}$$

2. MULTIPLE REGRESSION ANALYSIS

It may well be that several economic variables influence the variable that one is interested in forecasting. For example, the levels of the Gross National Product (GNP), personal disposable income, or price indices can assert influences on the firm. Multiple regression is an extremely easy statistical tool for researchers and management to employ due to the great proliferation of computer software. The general form of the two-independent variable multiple regression line is:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \varepsilon_t,\ t = 1, \ldots, N \tag{26}$$

In matrix notation multiple regression can be written:

$$Y = X\beta + \varepsilon \tag{27}$$

Multiple regression analysis requires unbiasedness, the expected value of the error term is zero, and the X's are fixed and independent of the error term. The error term is an identically and independently distributed normal variable. Least squares estimation of the coefficients yields:

$$\begin{aligned} \hat{\beta} &= (\hat{\beta}_1, \hat{\beta}_2, \hat{\beta}_3) \\ Y &= X\hat{\beta} + e \end{aligned} \tag{28}$$

Multiple regression, using the least squared principle, minimizes the sum of the squared error terms:

$$\begin{aligned} &\sum_{i=1}^{N} e_1^2 = e'e \\ &(Y-X\hat{\beta})'(Y-X\hat{\beta}) \end{aligned} \tag{29}$$

To minimize the sum of the squared error terms, one takes the partial derivative of the squared errors with respect to $\hat{\beta}$ and the partial derivative set equal to zero.

$$\partial \frac{(e'e)}{\partial \beta} = -2X'Y + 2X'X\hat{\beta} = 0 \tag{30}$$

$$\hat{\beta} = (X'X)^{-1}X'Y$$

Alternatively, one could solve the normal equations for the two-variable to determine the regression coefficients.

$$\begin{aligned} \Sigma Y &= \beta_1 N + \hat{\beta}_2 \Sigma X_2 + \hat{\beta}_3 \Sigma X_3 \\ \Sigma X_2 Y &= \hat{\beta}_1 \Sigma X_2 + \hat{\beta}_2 X_2^2 + \hat{\beta}_3 \Sigma X_2 X_3 \\ \Sigma X_3 Y &= \hat{\beta}_1 \Sigma X_3 + \hat{\beta}_2 \Sigma X_3 X_2 + \hat{\beta}_3 \Sigma X_3^2 \end{aligned} \tag{31}$$

When we solved the normal equations, (7), to find the a and b that minimized the sum of our squared error terms in simple liner regression, and when we solved the two variable normal equations, equation (31) to find the multiple regression estimated parameters, we made several assumptions. First, we assumed that the error term is independently and identically distributed; i.e., a random variable with an expected value, or mean of zero, and a finite, and constant, standard deviation. The error term should not be a function of time, as we discussed with the Durbin-Watson statistic, equation (21), nor should the error term be a function of the size of the independent variable (s), a condition known as heteroscedasticity. One may plot the residuals as a function of the independent variable (s) to be certain that the residuals are independent of the independent variables. The error term should be a normally distributed variable. That is, the error terms should have an expected value of zero and 68.26 percent of the observed error terms should fall within the mean value plus and minus one standard deviation of the error terms (the so-called "Bell Curve" or normal distribution). Ninety-five percent of the observations should fall within the plus or minus two standard deviation levels, the so-called 95 percent confidence interval. The presence of extreme, or influential, observations may distort estimated regression lines and the corresponding estimated residuals. Another problem in regression analysis is the assumed independence of the independent variables in equation (31). Significant correlations may produce estimated regression coefficients that are "unstable" and have the "incorrect" signs, conditions that we will observe in Chapter 14. Let us spend some time discussing two problems discussed in this section, the problems of influential observations, commonly known as outliers, and the correlation among independent variables, known as multicollinearity.

There are several methods that one can use to identify influential observations or outliers. First, we can plot the residuals and 95 percent confidence intervals and examine how many observations have residuals falling outside these limits. One should expect no more than 5 percent of the observations to fall outside of these intervals. One may find that one or two observations may distort a regression estimate even if there are 100 observations in the database. The estimated residuals should be normally distributed, and the ratio of the residuals divided by their standard deviation, known as standardized residuals, should be a normal variable. We showed, in equation (29), that in multiple regression:

$$\hat{\beta} = (X'X)X'Y$$

The residuals of the estimated multiple regression line are given by:

$$e = Y' - \hat{\beta}X$$

The standardized residual concept can be modified such that the reader can calculate a variation on that term to identify influential observations. If we delete observation i in a regression, we can measure the change in estimated regression coefficients and residuals. Belsley, Kuh, and Welsch (1980), showed that the estimated regression coefficients change by an amount, DFBETA, where:

$$DFBETA_i = \frac{(X'X)^{-1}X'e_i}{1-h_i} \tag{32}$$

where

$$h_i = X_i(X'X)^{-1}X_i'$$

The h_i or "hat," term is calculated by deleting observation i. The corresponding residual is known as the studentized residual, sr, and defined as:

$$sr_i = \frac{e_i}{\hat{\sigma}\sqrt{1-h_i}} \tag{33}$$

where $\hat{\sigma}$ is the estimated standard deviation of the residuals. A studentized residual that exceeds 2.0 indicates a potential influential observation [Belsley, et al., 1980]. Another distance measure has been suggested by Cook (1977), which modifies the studentized residual, to calculate a scaled residual known as the Cook distance measure, CookD. As the researcher or modeler deletes observations, one needs to compare the original matrix of the estimated residuals variance matrix. The COVRATIO calculation performs this calculation, where:

$$COVRATIO = \frac{1}{\left[\frac{n-p-1}{n-p} + \frac{e_i*}{(n-p)}\right]^p (1-h_i)} \tag{34}$$

where n = number of observations,
p = number of independent variables,
and e_i* = deleted observations.

If the absolute value of the deleted observation > 2, then the COVRATIO calculation approaches:

$$1 - \frac{3p}{n} \tag{35}$$

A calculated COVRATIO that is larger than 3p/n indicates an influential observation. The DFBETA, studentized residual, CookD, and COVRATIO calculations may be performed within SAS, as we will see in the Public Service Electric & Gas (PSE&G) analysis in the case following this chapter. The identification of influential data is an important component of regression analysis. One may create variables for use in multiple regression that make use of the influential data, or outliers, to which they are commonly referred.

The modeler can identify outliers, or influential data, and re-run the ordinary least squares regressions on the re-weighted data, a process referred to as robust (ROB) regression. In ordinary least squares, OLS, all data is equally weighted. The weights are 1.0. In robust regression one weights the data universally with its OLS residual; i.e., the larger the residual, the smaller the weight of the observation in the robust regression. In robust regression, several weights may be used. We will see the Huber (1973) and Beaton-Tukey (1974) weighting schemes in our analysis. In the Huber robust regression procedure, one uses the following calculation to weigh the data:

$$w_i = \left(1 - \left(\frac{|e_i|}{\sigma_i}\right)^2\right)^2 \tag{36}$$

where e_i = residual I,
σ_I = standard deviation of residual
and w_i = weight of observation i.

The intuition is that the larger the estimated residual, the smaller the weight. A second robust re-weighting scheme is calculated from the Beaton-Tukey biweight criteria where:

$$w_i = \left(1 - \left(\frac{\frac{|e_i|}{\sigma_e}}{4.685}\right)^2\right)^2, \quad if\ \frac{|e_i|}{\sigma_e} > 4.685; \tag{37}$$

$$1, \quad if\ \frac{|e_i|}{\sigma_e} < 4.685.$$

A second major problem is one of multicollinearity, the condition of correlations among the independent variables. If the independent variables are perfectly correlated in multiple regression, then the (X′X) matrix of equation (30), cannot be inverted and the multiple regression coefficients have multiple solutions. In reality, highly correlated independent variables can produce unstable regression coefficients due to an unstable $(X'X)^{-1}$ matrix. Belsley et al. advocate the calculation of a condition number, which is the ratio of the largest latent root of the correlation matrix relative to the smallest latent root of the correlation matrix. A condition number exceeding 30.0 indicates severe multicollinearity.

The latent roots of the correlation matrix of independent variables can be used to estimate regression parameters in the presence of multicollinearity. The latent roots, l_1, l_2, …, l_p and the latent vectors γ_1, γ_2, … γ_p of the P independent variables can describe the inverse of the independent variable matrix of equation (29).

$$(X'X)^{-1} = \sum_{j=1}^{p} l_j^{-1} \gamma_j \gamma_j'$$

Multicollinearity is present when one observes one or more small latent vectors. If one eliminates latent vectors with small latent roots (l < .30) and latent vectors ($\gamma < .10$), the "principal component" or latent root regression estimator may be written as:

$$\hat{\beta}_{LRR} = \sum_{j=0}^{P} f_j \, \delta_j$$

where

$$f_j = \frac{-\eta\gamma_0 \lambda_j^{-1}}{\sum_q \gamma_0^2 \lambda_q^{-1}}$$

where

$$n^2 = \Sigma(y - \overline{y})^2$$

and λ are the "non-zero" latent vectors. One eliminates the latent vectors with non-predictive multicollinearity. We use latent root regression on the Beaton-Tukey weighted data in Chapters 14 and 21.

3. THE CONFERENCE BOARD COMPOSITE INDEX OF LEADING ECONOMIC INDICATORS AND REAL US GDP GROWTH: A REGRESSION EXAMPLE

The composite indexes of leading (LEI), coincident, and lagging indicators produced by The Conference Board are summary statistics for the U.S. economy. Wesley Clair Mitchell of Columbia University constructed the indicators in 1913 to serve as a barometer of economic activity. The leading indicator series was developed to turn upward before aggregate economic activity increased, and decrease before aggregate economic activity diminished. Historically, the cyclical turning points in the leading index have occurred before those in aggregate economic activity, cyclical turning points in the coincident index have occurred at about the same time as those in aggregate economic activity, and cyclical turning points in the lagging index generally have occurred after those in aggregate economic activity.

The Conference Board's components of the composite leading index for the year 2002 reflects the work and variables shown in Zarnowitz (1992) list, which continued work of the Mitchell (1913, 1927, 1951), Burns and Mitchell (1946), and Moore (1961). The Conference Board index of leading indicators is composed of:

1. Average weekly hours (mfg.);
2. Average weekly initial claims for unemployment insurance;
3. Manufacturers' new orders for consumer goods and materials;
4. Vendor performance;
5. Manufacturers' new orders of non-defense capital goods;
6. Building permits of new private housing units;
7. Index of stock prices;
8. Money supply;
9. Interest rate spread;
10. Index of consumer expectations.

The Conference Board composite index of leading economic indicators, LEI, is an equally weighted index in which its components are standardized to produce constant variances. Details of the LEI can be found on The Conference Board website, *www.conference-board.org*, and the reader is referred to Zarnowitz (1992) for his seminal development of underlying economic assumption and theory of the LEI and business cycles.

Table 2. The Conference Board Leading, Coincident, and Lagging Indicator Components

		Leading index	Standardization Factor
1.	BCI-01	Average weekly hours, manufacturing	.1946
2.	BCI-05	Average weekly initial claims for unemployment insurance	.0268
3.	BCI-06	Manufacturers' new orders, consumer goods and materials	.0504
4.	BCI-32	Vendor performance, slower deliveries diffusion index	.0296
5.	BCI-27	Manufacturers' new orders, non-defense capital goods	.0139
6.	BCI-29	Building permits, new private housing units	.0205
7.	BCI019	Stock prices, 500 common stocks	.0309
8.	BCI-106	Money supply, M2	.2775
9.	BCI-129	Interest rate spread, 10-year Treasury bonds less federal funds	.3364
10.	BCI-83	Index of consumer expectations	.0193
		Coincident Index	
1.	BCI-41	Employees on nonagricultural payrolls	.5186
2.	BCI-51	Personal income less transfer payments	.2173
3.	BCI-47	Industrial production	.1470
4.	BCI-57	Manufacturing and trade sales	.1170
		Lagging Index	
1.	BCI-91	Average duration of unemployment	..0368
2.	BCI-77	Inventories to sales ratio, manufacturing and trade	.1206
3.	BCI-62	Labor cost per unit of output, manufacturing	.0693
4.	BCI-109	Average prime rate	.2692
5.	BCI-101	Commercial and industrial loans	.1204
6.	BCI-95	Consumer installment credit to personal income ratio	.1951
7.	BCI-120	Consumer price index for services	.1886

Let us illustrate a forecast of real US GDP solving normal equations (8) by hand calculating the several of the estimated regression coefficients shown in Table 2. One can calculate the estimated single variable regression parameters, a and b, for the equation, where GDP is a function of the LEI.:

$\text{dlog US GDP}_t = a + b \text{ dlog US LEI}_{t-1}$

$$b = \frac{n(\Sigma XY) - \Sigma X(\Sigma Y)}{n\Sigma X^2 - (\Sigma X)^2}$$

$$a = \frac{\Sigma Y}{n} - b\frac{\Sigma X}{n}$$

$n = 127$
$\Sigma X = .4142$
$\Sigma X^2 = .0240$
$\Sigma Y = .9631$
$\Sigma Y^2 = .0172$
$\Sigma XY = .0107$

$$\hat{b} = \frac{127(.0107) - .4142(.9631)}{127(.0240) - (.4142)^2}$$

$$\hat{b} = \frac{1.3589 - .3989}{3.048 - .1716}$$

$$\hat{b} = \frac{.960}{2.8764} = \underline{\underline{.33}}$$

$$\hat{a} = \frac{.9631}{127} - .334\ (\frac{.4412}{127})$$

$$\hat{a} = .0076 - .334(.0033) =$$

$$\hat{a} = .0076 - .0011 = .0065$$

The regression coefficient on the LEI variable, 0.33, in Table 3, is highly statistically significant because the calculated t-value of 6.06 exceeds 1.96, the 5 percent critical level. One can reject the null hypothesis of no association between the growth rate of US GDP and the growth rate of the LEI. The reader notes, however, that we estimated the regression line with current, or contemporaneous, values of the LEI series.

The LEI series was developed to “forecast” future economic activity such that current growth of the LEI series should be associated with future US GDP growth rates. Alternatively, one can examine the regression association of the current values of real US GDP growth and previous or lagged values, of the LEI series. How many lags might be

Table 3. Real U.S. GDP and the Leading Indicators: A Contemporaneous Examination
Dependent Variable: DLUSGDP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.003	0.003	59.90	<.000
Error	126	0.007	0.000		
Corrected Total	127	0.010			
Root MSE		0.008	R-Square	0.284	
Dependent Mean		0.008	Adj R-Sq	0.278	
Coeff Var		99.688			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T Value	Pr > |t|
Intercept	1	0.006	0.001	0.260	<.000
DLUSLEI	1	0.350	0.050	6.060	<.000

appropriate? Let us estimate regression lines using up to four lags of the US LEI series. If one estimates multiple regression lines using the SAS software, as shown in Table 4, the first lag of the LEI series is statistically significant, having an estimated t-value of 5.56, and the second lag is not statistically significant, having an estimated t-value of only 1.06. In the regression analysis using three lags of the LEI series, the first lagged variable is highly statistically significant, the second lag is not statistically significant, and the third LEI lag variable has an estimated t-value of 1.06, statistically significant at the 30 percent level. The critical t-level at the 10 percent level is 1.645, for 30 observations, and statistical studies often use the 10 percent level as a minimum acceptable critical level. The third lag is not statistically significant in the three quarter multiple regression analysis. In the four quarter lag analysis of the LEI series, we report that the lag one variable has a t-statistic of 5.96, highly significant, whereas the second lag has a t-statistic of 0.04, which is not statistically significant. The third LEI lag variable has a t-statistic of 1.52, statistically significant at the 14 percent level, which is very marginal. The fourth LEI lag variable has an estimated t-statistic of -.09, which is not statistically significant. The estimation of multiple regression lines would lead the reader to expect a one, and possibly three, variable lag structure to illustrate the relationship between real US GDP growth and The Conference Board LEI series. The next chapter develops the relationship using time series and forecasting techniques. This chapter used regression analysis to illustrate the

Table 4. Real U.S. GDP and the Leading Indicators

C	LEI	LEI1	LEI2	LEI3	LEI4	R^2	F
.006	.350					.278	49.9
(9.26)	(7.06)						
.007		.331				.245	42.0
(9.24)		(6.48)					
.007		.317	.059			.257	22.4
(8.79)		(5.56)	(1.06)				
.006		.325	.012	.059		.258	15.3
(8.87)		(5.75)	(0.20)	(1.06)			
.006		.328	.003	.091	-.004	.276	12.8
(8.64)		(5.96)	(0.04)	(1.52)	(-.08)		

association between real US GDP growth and the leading economic indicator series. The regression techniques calculated in this chapter and the time series techniques shown in Chapter 13 will be used to create pro forma income statements and balance sheets for IBM. The creation of the pro forma balance sheet will help determine the firm's required borrowings from the capital market.

The reader is referred to Table 5 for SAS output for the multiple regression of U.S. real GDP and four quarterly lags in LEI.

Table 5. The REG Procedure

Dependent Variable: DLUSGDP
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	0.003	0.001	12.69	<.000
Error	119	0.006	0.000		
Corrected Total	123	0.009			
Root MSE		0.007	R-Square	0.299	
Dependent Mean		0.008	Adj R-Sq	0.276	
Coeff Var		97.205			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.006	0.001	8.63	<.000
DLUSLE1	1	0.326	0.055	5.96	<.000
DLUSLE2	1	0.003	0.060	0.04	.965
DLUSLE3	1	0.091	0.060	1.52	.131
DLUSLE4	1	-0.005	0.054	-0.09	.927

Notes

[1]See Chapter 6.

[2]The reader is referred to an excellent statistical reference, such as Irwin Miller and J.E. Freund, *Probability and Statistics for Engineers*, (Englewood Cliffs, NJ: Prentice-Hall, 1965).

[3]Cochrane D. and G.H. Orcutt. 1949. "Application of Least Squares Regression to Relationships Containing Autocorrelated Error Terms," *Journal of the American Statistical Association* 44: 32-61.

[4]The reader is referred to C.T. Clark and L.L. Schkade, Statistical Analysis for Administrative Decisions (Cincinnati: South-Western Publishing Company, 1979) for an excellent treatment of this topic.

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Appendix

Let us follow The Conference Board definitions:

Leading index components

BCI-01 Average weekly hours, manufacturing. The average hours worked per week by production workers in manufacturing industries tend to lead the business cycle because employers usually adjust work hours before increasing or decreasing their workforce.

BCI-05 Average weekly initial claims for unemployment insurance. The number of new claims filed for unemployment insurance are typically more sensitive than either total employment or unemployment to overall business conditions, and this series tends to lead the business cycle. It is inverted when included in the leading index; the signs of the month-to-month changes are reversed, because initial claims increase when employment conditions worsen (i.e., layoffs rise and new hirings fall).

BCI-06 Manufacturers' new orders, consumer goods and materials (in 1996 $). These goods are primarily used by consumers. The inflation-adjusted value of new orders leads actual production because new orders directly affect the level of both unfilled orders and inventories that firms monitor when making production decisions. The Conference Board deflates the current dollar orders data using price indexes constructed from various sources at the industry level and a chain-weighted aggregate price index formula.

BCI-32 Vendor performance, slower deliveries diffusion index. This index measures the relative speed at which industrial companies receive deliveries from their suppliers. Slowdowns in deliveries increase this series and are most-often associated with increases in demand for manufacturing supplies (as opposed to a negative shock to supplies) and, therefore, tend to lead the business cycle. Vendor performance is based on a monthly survey conducted by the National Association of Purchasing Management (NAPM) that asks purchasing managers whether their suppliers' deliveries have been faster, slower, or the same as the previous month. The slower-deliveries diffusion index counts the proportion of respondents reporting slower deliveries, plus one-half of the proportion reporting no change in delivery speed.

BCI-27 Manufacturers' new orders, non-defense capital goods (in 1996 $). New orders received by manufacturers in non-defense capital goods industries (in inflation-adjusted dollars) are the producers' counterpart to BCI-06.

BCI-29 Building permits, new private housing units. The number of residential building permits issued is an indicator of construction activity, which typically leads most other types of economic production.

BCI-19 Stock prices, 500 common stocks. The Standard & Poor's 500 stock index reflects the price movements of a broad selection of common stocks traded on the New York Stock Exchange. Increases (decreases) of the stock index can reflect both the general sentiments of investors and the movements of interest rates, which is usually another good indicator for future economic activity.

BCI-106 Money supply (in 1996 $). In inflation-adjusted dollars, this is the M2 version of the money supply. When the money supply does not keep pace with inflation, bank lending may fall in real terms, making it more difficult for the economy to expand. M2 includes currency, demand deposits, other checkable deposits, travelers checks, savings deposits, small denomination time deposits, and balances in money market mutual funds. The inflation adjustment is based on the implicit deflator for personal consumption expenditures.

BCI-129 Interest rate spread, 10-year Treasury bonds less federal funds. The spread or difference between long and short rates is often called the yield curve. This series is constructed using the 10-year Treasury bond rate and the federal funds rate, an overnight interbank borrowing rate. It is felt to be an indicator of the stance of monetary policy and general financial conditions because it rises (falls) when short rates are relatively low (high). When it becomes negative (i.e., short rates are higher than long rates and the yield curve inverts) its record as an indicator of recessions is particularly strong.

BCI-83 Index of consumer expectations. This index reflects changes in consumer attitudes concerning future economic conditions and, therefore, is the only indicator in the leading index that is completely expectations-based. Data are collected in a monthly survey conducted by the University of Michigan's Survey Research Center. Responses to the questions concerning various economic conditions are classified as positive, negative, or unchanged. The expectations series is derived from the responses to three questions relating to: (1) economic prospects for the respondent's family over the next 12 months;
(2) the economic prospects for the Nation over the next 12 months; and (3) the economic prospects for the Nation over the next five years.

Chapter 13

TIME SERIES MODELING AND THE FORECASTING EFFECTIVENESS OF THE U.S. LEADING ECONOMIC INDICATORS

An important aspect of financial decision making may depend on the forecasting effectiveness of the composite index of leading economic indicators, LEI. The leading indicators can be used as an input to a transfer function model of real Gross Domestic Product, GDP. The previous chapter employed four quarterly lags of the LEI series to estimate regression models of association between current rates of growth of real US GDP and the composite index of leading economic indicators. This chapter asks the question as to whether changes in forecasted economic indexes help forecast changes in real economic growth. The transfer function model forecasts are compared to several naïve models in terms of testing which model produces the most accurate forecast of real GDP. No-change forecasts of real GDP and random walk with drift models may useful forecasting benchmarks [Mincer and Zarnowitz (1969) and Granger and Newbold (1977)]. Economists have constructed leading economic indicator series to serve as a business barometer of the changing U.S. economy since the time of Wesley C. Mitchell (1913). The purpose of this study is to examine the time series forecasts of composite economic indexes produced by The Conference Board (TCB), and test the hypothesis that the leading indicators are useful as an input to a time series model to forecast real output in the United States.

Economic indicators are descriptive and anticipatory time-series data used to analyze and forecast changing business conditions. Cyclical indicators are comprehensive series that are systemically related to the business cycle. Business cycles are recurrent sequences of expansions and contractions in aggregate economic activity. Coincident indicators have cyclical movements that are approximately correspond with the overall business cycle expansions and contractions. Leading indicators reach their turning points before the corresponding business cycle turns. The lagging indicators reach their turning points after the corresponding turns in the business cycle.

An example of business cycles can be found in the analysis of Irving Fisher (1911), who discussed how changes in the money supply lead to rising prices and an initial fall in the rate of interest, and how this results in raising profits, creating a boom. The interest rate later rises, reducing profits, and ending the boom. A financial crisis ensues when businessmen, whose loan collateral is falling as interest rates rise, run to cash and banks fail. The money supply is one series in The Conference Board index of leading economic indexes, LEI.

Section 2 of this chapter presents an introduction to the models that are estimated and tested in the analysis of the forecasting effectiveness of the leading indicators. Section 3 presents the empirical evidence to support the time series models and reports how models adequately describe the data. Out-of-sample forecasting results are shown in section 4 for the United States (U.S.) and the G7 nations.[1]

1. BASIC STATISTICAL PROPERTIES OF ECONOMIC SERIES

This chapter develops and forecasts models of economic time series in which we initially use only the past history of the series. The chapter later explores explanatory variables in the forecast models. The time series modeling approach of Box and Jenkins involves the identification, estimation, and forecasting of stationary (or series transformed to stationarity) series through the analysis of the series autocorrelation and partial autocorrelation functions.[2] The autocorrelation function examines the correlations of the current value of the economic times series and its previous k-lags. That is, one can measure the correlation of a daily series, of shares, or other assets, by calculating:

$$p_{jt} = a + b\, p_{jt-1} \tag{1}$$

where p_{jt} = today's price of stock j;
p_{jt-1} = yesterday's price of stock j;
and b is the correlation coefficient.

In a daily shares price series, b is quite large, often approaching a value of 1.00. As the number of lags, or previous number of periods increase, the correlation tend to fall. The decrease is usually very gradual.

The partial autocorrelation function examines the correlation between p_{jt} and p_{jt-2}, holding constant the association between p_{jt} and p_{jt-1}. If a series follows a random walk, the correlation between p_{jt} and p_{jt-1} is one, and the correlation between p_j and p_{jt-2}, holding constant the correlation of p_{jt} and p_{jt-1} is zero. Random walk series are characterized with decaying autocorrelation functions and a partial autocorrelation function with a "spike" at lag one, and zeros thereafter. Stationarity implies that the joint probability [p(Z)] distribution $P(Z_{t1},Z_{t2})$ is the same for all times t, t_1, and t_2 where the observations are separated by a constant time interval. The autocovariance of a time series at some lag or interval, k, is defined to be the covariance between Z_t and Z_{t+k}

$$\gamma_k = \mathrm{cov}[Z_t, Z_{t+k}] = E[(Z_t - \mu)(Z_{t+k} - \mu)]. \tag{2}$$

One must standardize the autocovariance, as one standardizes the covariance in traditional regression analysis, before one can quantify the statistically significant association between Z_t and Z_{t+k}. The autocorrelation of a time series is the standardization of the autocovariance of a time series relative to the variance of the time series, and the autocorrelation at lag k, ρ_k, is bounded between +1 and -1.

$$\rho_k = \frac{E[(Z_t - \mu)(Z_{t+k} - \mu)]}{\sqrt{E[(Z_t - \mu)^2]E[(Z_{t+k} - \mu)^2]}}$$

$$= \frac{E[(Z_t - \mu)(Z_{t+k} - \mu)]}{\sigma_Z^2} = \frac{r_k}{r_0} \tag{3}$$

The autocorrelation function of the process, {ρk}, represents the plotting of r_k versus time, the lag of k. The autocorrelation function is symmetric about series and thus $\rho_k = \rho_{-k}$; thus, time series analysis normally examines only the positive segment of the autocorrelation function. One may also refer to the autocorrelation function as the correlogram. The statistical estimates of the autocorrelation function are calculated from a finite series of N observations, Z_1, Z_2, Z_3, …, Z_n. The statistical estimate of the autocorrelation function at lag k, r_k, is found by

$$r_k = \frac{C_k}{C_0}$$

where

$$C_k = \frac{1}{N}\sum_{t=1}^{N-k}(Z_t - \bar{Z})(Z_{t+k} - \bar{Z}), k = 0,1,2,...,K.$$

Ck is, of course, the statistical estimate of the autocovariance function at lag k. In identifying and estimating parameters in a time series model, one seeks to identify orders (lags) of the time series that are statistically different from zero. The implication of testing whether an autocorrelation estimate is statistically different from zero leads one back to the t-tests used in regression analysis to examine the statistically significant association between variables. One must develop a standard error of the autocorrelation estimate such that a formal t-test can be performed to measure the statistical significance of the autocorrelation estimate. Such a standard error, S_e, estimate was found by Bartlett and, in large samples, is approximated by

$$Var[r_k] \cong \frac{1}{N}, \text{ and}$$
$$S_e[r_k] \cong \frac{1}{\sqrt{N}}. \tag{4}$$

An autocorrelation estimate is considered statistically different from zero if it exceeds approximately twice its standard error.

A second statistical estimate useful in time series analysis is the partial autocorrelation estimate of coefficient j at lag k, ϕ_{kj}. The partial autocorrelations are found in the following manner:

$$\rho_j = \phi_{kl}\rho_{j-1} + \phi_{k2}\rho_{j-2} + \ldots + \phi_{k(k-1)}\, \rho_{jk-1} + \phi_{kk}\rho_{j-k} \qquad j = 1,2,\ldots,k$$

or

$$\begin{bmatrix} 1 & \rho_1 & \rho_2 & \cdots & \rho_{k-1} \\ \rho_1 & 1 & \rho_1 & \cdots & \rho_{k-2} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ \rho_{k-1} & \rho_{k-2} & \rho_{k-3} & \cdots & 1 \end{bmatrix} \begin{bmatrix} \phi_{k1} \\ \phi_{k2} \\ \vdots \\ \phi_{kk} \end{bmatrix} \begin{bmatrix} \rho_1 \\ \rho_2 \\ \vdots \\ \rho_k \end{bmatrix}$$

The partial autocorrelation estimates may be found by solving the above equation systems for k = 1,2,3,… k.

$$\phi_{11} = \rho_1$$

$$\phi_{22} = \frac{\rho_2 - \rho_1^2}{1-\rho_1^2} = \frac{\begin{vmatrix} 1 & \rho_1 \\ \rho_2 & \rho_2 \end{vmatrix}}{\begin{vmatrix} 1 & \rho_1 \\ \rho_1 & 1 \end{vmatrix}}$$

$$\phi_{33} = \frac{\begin{vmatrix} 1 & \rho_1 & \rho_1 \\ \rho_1 & 1 & \rho_2 \\ \rho_2 & \rho_1 & \rho_3 \end{vmatrix}}{\begin{vmatrix} 1 & \rho_1 & \rho_2 \\ \rho_1 & 1 & \rho_1 \\ \rho_2 & \rho_1 & 1 \end{vmatrix}}$$

The partial autocorrelation function is estimated by expressing the current autocorrelation function estimates as a linear combination of previous orders of autocorrelation estimates

$$\hat{r}_1 = \hat{\phi}_{k1^r\,j-1} + \hat{\phi}_{k2^2\,j-2} + \ldots + \hat{\phi}_{k(k-1)^r\,j+k-1} + \hat{\phi}_{kk^2\,j-k} \qquad j = 1,2,\ldots,k.$$

The standard error of the partial autocorrelation function is approximately

$$Var[\hat{\phi}_{kk}] \cong \frac{1}{N}, \text{ and}$$
$$S_e[\phi_{kk}] \cong \frac{1}{\sqrt{N}}.$$

1.1 The Autoregressive and Moving Average Processes

A stochastic process, or time series, can be repeated as the output resulting from a white noise input, α_t.[3]

$$\begin{aligned} \widetilde{Z}_t &= \alpha_t + \psi_1 \alpha_{t-1} + \psi_2 \alpha_{t-2} + \ldots \\ &= \alpha_t + \sum_{j=1}^{\infty} \psi_j a_{t-j}\,. \end{aligned} \qquad (5)$$

The filter weight, ψ_j, transforms input into the output series. One normally expresses the output, $\widetilde{Z}_t$, as a deviation of the time series from its mean, μ, or origin

$$\widetilde{Z}_t = Z_t - \mu.$$

The general linear process leads one to represent the output of a time series, $\widetilde{Z}_t$, as a function of the current and previous value of the white noise process, α_t which may be represented as a series of shocks. The white noise process, α_t, is a series of random variables characterized by

$$E[\alpha_t] \cong 0$$

$$Var[\alpha_t] = \sigma_\alpha^2$$

$$\gamma_k = E[\alpha_t \alpha_{t+k}] = \sigma_\alpha^2 \qquad k \neq 0$$
$$0 \qquad k = 0.$$

The autocorrelation function of a linear process may be given by

$$\gamma_k = \sigma_\alpha^2 \sum_{j=0}^{\infty} \psi_j \psi_{j+k}.$$

The backward shift operator, B, is defined as $BZ_t = Z_{t-1}$ and $B^j Z_t = Z_{t-}j$. The autocorrelation generating function may be written as:

$$\gamma(B) = \sum_{k=-\infty}^{\infty} \gamma_k B^k$$

For stationarity, the ψ weights of a linear process must satisfy that $\psi(B)$ converges on or lies within the unit circle.

In an autoregressive, AR, model, the current value of the time series may be expressed as a linear combination of the previous values of the series and a random shock, α_t.

$$\tilde{Z}_t = \phi_1 \tilde{Z}_{t-1} + \phi_2 \tilde{Z}_{t-2} + \dots + \phi_p \tilde{Z}_{t-p} + \alpha_t$$

The autoregressive operatior of order P is given by

$$\phi(B) = 1 - \phi_1 B^1 - \phi_2 B^2 - \dots - \phi_p B^p$$

or

$$\phi(B) \tilde{Z}_t = \alpha_t \qquad (6)$$

In an autoregressive model, the current value of the time series, $\tilde{Z}_t$, is a function of previous values of the time series, $\tilde{Z}_{t-1}$, $\tilde{Z}_{t-2}$, … and is similar to a multiple regression model. An autoregressive model of order p implies that only the first p order weights are non-zero. In many economic time series, the relevant autogressive order is one and the autoregressive process of order p, AR(p) is written as

$$\tilde{Z}_t = \phi_1 \tilde{Z}_{t-1} + \alpha_t$$

or

$$(1- \phi_1 B)\tilde{Z}_t = \alpha_t \text{ implying}$$
$$\tilde{Z}_t = \phi^{-1}(B)\alpha_t.$$

The relevant stationarity condition is $|B| < 1$ implying that $|\phi_1| < 1$. The autocorrelation function of a stationary autoregressive process,

$$\tilde{Z}_t = \phi_1 \tilde{Z}_{t-1} + \phi_2 \tilde{Z}_{t-2} + ... + \phi_p \tilde{Z}_{t-p} + \alpha_t$$

may be expressed by the difference equation

$$P_k = \phi_1 \rho_{k-1} + \phi_2 \rho_{k-2} + ... + \phi_k \rho_{k-p} \; k > 0$$

Or expressed in terms of the Yule-Walker equation as

$$\rho_1 = \phi_1 + \phi_2 \rho_1 + ... + \phi_p \rho_{p-1}$$
$$\rho_2 = \phi_1 \rho_1 + \phi_2 + ... + \phi_p \rho_{p-2}$$
$$\overset{=}{\rho}_p \quad = \phi_1 \rho_{p-1} + \phi_2 \rho_{p-2} + ... + \overset{=}{\phi}_p$$

For the first-order AR process, AR(1)

$$\rho_k = \phi_1 \rho_{k-1} = \overset{=}{\phi}_p.$$

The autocorrelation function decays exponentially to zero when ϕ_1 is positive and oscillates in sign and decays exponentially to zero when ϕ_1 is negative.

$$P_1 = \phi_1$$

and

$$\sigma_2 = \frac{\sigma_\alpha^2}{1-\phi_1^2}.$$

The partial autocorrelation function cuts off after lag one in an AR(1) process. For a second order AR process, AR(2)

$$\tilde{Z}_t = \phi_1 \tilde{Z}_{t-1} + \phi_2 \tilde{Z}_{t-k} + \alpha_t$$

with roots

$$\phi(B) = 1 - \phi_1 B - \phi_2 B^2 = 0$$

and, for stationarity, roots lying outside the unit circle, ϕ_1 and ϕ_2 must obey the following conditions

$$\phi_2 + \phi_1 < 1$$
$$\phi_2 - \phi_1 < 1$$
$$-1 < \phi_2 < 1.$$

The autocorrelation function of an AR(2) model is

$$\rho_k = \phi_1 \rho_{k-1} + \phi_2 \rho_{k-2} \tag{7}$$

The autocorrelation coefficients may be expressed in terms of the Yule-Walker equations as

$$\rho_1 = \phi_1 + \phi_2 \rho_2$$
$$\rho_2 = \phi_1 \rho_1 + \phi_2$$

which implies

$$\phi_1 = \frac{\rho_1 (1 - \rho_2)}{1 - \rho_1^2}$$

$$\phi_2 = \frac{\rho_2 (1 - \rho_1^2)}{1 - \rho_1^2}$$

and

$$\rho_1 = \frac{\phi_1}{1 - \phi_2} \text{ and } \rho_2 = \phi_2 + \frac{\phi_1^2}{1 - \phi_2}.$$

For a stationary AR(2) process,

$$-1 < \phi_1 < 1$$
$$-1 < \rho_2 < 1$$
$$\rho_1^2 < \frac{1}{2}(\rho_2 + 1).$$

In an AR(2) process, the autocorrelation coefficients tail off after order two and the partial autocorrelation function cuts off after the second order (lag).[4]

In a q-order moving average (MA) model, the current value of the series can be expressed as a linear combination of the current and previous shock variables

$$\begin{aligned} \tilde{Z}_t &= \alpha_1 - \theta_1 \alpha_{t-1} - \ldots - \alpha_q \theta_{t-q} \\ &= (1 - \theta_1 B_1 - \ldots - \theta_q B_q) \alpha_t \\ &= \theta(B) \alpha_t \end{aligned}$$

The autocovariance function of a q-order moving average model is

$$\gamma_k = E[(\alpha_t - \theta_1\alpha_{t-1} - \ldots - \theta_q\alpha_{t-q})(\alpha_{t-k} - \theta_1\alpha_{t-k-1} - \ldots - \theta_q\alpha_{t-k-q})]$$

The autocorrelation function, ρ_k, is

$$\rho_k = \begin{cases} \dfrac{-\theta_k + \theta_1\theta_{k+1} + \ldots + \theta_{q-k}\theta_q}{1+\theta_1^2 + \ldots + \theta_q^2} & k = 1,2,\ldots,q \\ 0 & k > q \end{cases}$$

The autocorrelation function of a MA(q) model cuts off, to zero, after lag q and its partial autocorrelation function tails off to zero after lag q. There are no restrictions on the moving average model parameters for stationarity; however, moving average parameters must be invertible. Invertibility implies that the π weights of the linear filter transforming the input into the output series, the π weights lie outside the unit circle.

$$\pi(B) = \psi^{-1}(B)$$
$$= \sum_{j=0}^{a} \phi^j B^j$$

In a first-order moving average model, MA(1)

$$\widetilde{Z}_t = (1 - \theta_1 B)\alpha_t$$

and the invertibility condition is $|\theta_1| < 1$. The autocorrelation function of the MA(1) model is

$$\rho_k = \begin{cases} \dfrac{-\theta_1}{1+\theta_1^2} & k = 1 \\ & k > 2. \end{cases}$$

The partial autocorrelation function of an MA(1) process tails off after lag one and its autocorrelation function cuts off after lag one.

In a second-order moving average model, MA(2)

$$\widetilde{Z}_t = \alpha_t - \theta_1\alpha_{t-1} - \theta_2\alpha_{t-2}$$

the invertibility conditions require

$$\theta_2 < \theta_1 < 1$$
$$\theta_2 - \theta_1 < 1$$
$$-1 < \theta_2 < 1$$

The autocorrelation function of the MA(2) is

$$\rho_1 = \frac{-\theta_1(1-\theta_2)}{1+\theta_1^2+\theta_1^2}$$

$$\rho_2 = \frac{-\theta_2}{1+\theta_1^2+\theta_1^2}$$

and

$\rho_k = \theta$ for $k > 3$.

The partial autocorrelation function of an MA(2) tails off after lag two.

In many economic time series, it is necessary to employ a mixed autoregressive-moving average (ARMA) model of the form

$$\tilde{Z}_t = \phi_1 \tilde{Z}_{t-1} + \ldots + \phi_p \tilde{Z}_{t-p} + \alpha_t - \theta_1\alpha_{t-1} - \ldots - \theta_q \alpha_{t-q} \tag{8}$$

or

$$(1 - \phi_1 B - \phi_2 B^2 - \ldots - \theta_p B^p)\tilde{Z}_t = (1 - \theta_1 B - \theta_2 B^2 - \ldots - \theta_q B^q)\alpha_t$$

that may be more simply expressed as

$$\phi(B)\tilde{Z}_t = \theta(B)\alpha_t$$

The autocorrelation function of the ARMA model is

$$\rho_k = \phi_1\rho_{k-1} + \phi_2\rho_{k-2} + \ldots + \phi_p\rho_{k-p}$$

or

$$\phi(B)\rho_k = 0.$$

The first-order autoregressive-first order moving average operator ARMA(1,1) process is written

$$\tilde{Z}_t - \phi_1\tilde{Z}_{t-1} = \alpha_t - \theta_1\alpha_{t-1}$$

or

$$(1 - \phi_1)\tilde{Z}_t = (1 - \theta 1 B)\alpha_t .$$

The stationary condition is $-1 < \phi_1 < 1$ and the invertibility condition is $-1 < \phi_1 < 1$. The first two autocorrelations of the ARMA (1,1) model is

$$\rho_1 = \frac{(1-\phi_1\theta_1)(\phi_1-\theta_1)}{1+\theta_1^2-2\phi_1\theta_1}$$

and

$$\rho_2 = \phi_1\rho_1 .$$

The partial autocorrelation function consists only of $\phi_{11} = \rho_1$ and has a damped exponential.

An integrated stochastic progress generates a time series if the series is made stationary by differencing (applying a time-invariant filter) the data. In an integrated process, the general form of the time series model is

$$\phi(B)(1 - B)^d X_t = \theta(B)\varepsilon_t \tag{9}$$

where $\phi(B)$ and $\theta(B)$ are the autoregressive and moving average polynominals in B of orders p and q, ε_t is a white noise error term, and d is an integer representing the order of the data differencing. In economic time series, a first-difference of the data is normally performed.[5] The application of the differencing operator, d, produces a stationary ARMA(p,q) process. The autoregressive integrated moving average ARMA, model is characterized by orders p, d and q [ARIMA (p,d.q)]. Many economics series follow a random walk with drift, an ARMA (1,1) may be written as:

$$\overline{V}^{d} X_t = X_t - X_{t-1} = \varepsilon_t + b\varepsilon_{t-1}.$$

An examination of the autocorrelation function estimates may lead one to investigate using a first-difference model when the autocorrelation function estimates decay slowly. In an integrated process, the corr(X_t, $X_{t-\tau}$) is approximately unity for small values of time, τ.

2. ARMA MODEL IDENTIFICATION IN PRACTICE

Time series specialists use many statistical tools to identify models; however, the sample autocorrelation and partial autocorrelation function estimates are particularly useful in modeling. Univariate time series modeling normally requires larger data sets than regression and exponential smoothing models. It has been suggested that at least 40-50 observations be used to obtain reliable estimates.[6] One normally calculates the sample autocorrelation and partial autocorrelation estimates for the raw time series and its first (and possibly second) differences. The failure of the autocorrelation function estimates of the raw data series to die out as large lags implies that a first difference is necessary. The autocorrelation function estimates of a MA(q) process should cut off after q. To test whether the autocorrelation estimates are statistically different from zero, one uses a t-test where the standard error of υτ is

$$n^{-1/2}[1 + 2(\rho_1^2 + \rho_2^2 + ... + \rho_q^2)]^{1/2} \text{ for } \tau > q.$$ [7]

The partial autocorrelation function estimates of an AR(p) process cut off after lag p. A t-test is used to statistically examine whether the partial autocorrelations are statistically different from zero. The standard error of the partial autocorrelation estimates is approximately

$$\frac{1}{\sqrt{N}} \text{ for K } > p.$$

One can use the normality assumption of large samples in the t-tests of the autocorrelation and partial autocorrelation estimates. The identified parameters are generally considered statistically significant if the parameters exceed twice the standard errors.

The ARMA model parameters may be estimated using nonlinear least squares. Given the following ARMA framework generally pack-forecasts the initial parameter estimates and assumes that the shock terms are to be normally distributed.

$$\alpha_t = \widetilde{W}_t - \phi_1 \widetilde{W}_{t-1} - \phi_2 \widetilde{W}_{t-2} - \ldots - \phi_p \widetilde{W}_{t-p} + \theta_1 \alpha_{t-1} + \ldots + \theta_q \alpha_{t-q}$$

where

$$W_t = \overline{V}^d Z_t \text{ and } \widetilde{W}_t = W_t - \mu.$$

The minimization of the sum of squared errors with respect to the autoregressive and moving average parameter estimates produces starting values for the p order AR estimates and q order MA estimates.

$$\left.\frac{\partial e_t}{-\partial \phi_j}\right|_{\beta_0} = \mu_{j,t} \text{ and } \left.\frac{\partial e_t}{-\partial \theta_i}\right|_{\beta_0} = X_{j,t}$$

It may be appropriate to transform a series of data such that the residuals of a fitted model have a constant variance, or are normally distributed. The log transformation is such a data transformation that is often used in modeling economic time series. Box and Cox (1964) put forth a series of power transformations useful in modeling time series.[8] The data is transformed by choosing a value of λ that is suggested by the relationship between the series amplitude (which may be approximated by the range of sub-sets) and mean.[9]

$$X_t^{\lambda} = \frac{X_t^{\lambda} - 1}{\bar{X}^{\lambda-1}} \tag{10}$$

where X is the geometric mean of the series. One immediately recognizes that if λ = 0, the series is a logarithmic transformation. The log transformation is appropriate when there is a positive relationship between the amplitude and mean of the series. A λ = 1 implies that the raw data should be analyzed and there is no relationship between the series range and mean sub-sets. One generally selects the λ that minimizes the smallest residual sum of squares, although an unusual value of λ may make the model difficult to interpret. Some authors may suggest that only values of λ of -.5, 0, .5, and 1.0 be considered to ease in the model building process.[10]

Many time series, involving quarterly or monthly data, may be characterized by rather large seasonal components. The ARIMA model may be supplemented with seasonal autoregressive and moving average terms

$$(1 - \phi_1 B - \phi_2 B^2 - \ldots - \phi_p B^p)(1 - \phi_{1,s} B^s - \ldots - \phi_{p,s} B^p S^s)(1 - B)^d$$
$$(1 - B^s)^{ds} X_t = (1 - \theta_1 B - \ldots - \theta_q B^q)(1 - \theta_{1,s} B^s - \ldots$$
$$-\theta_{q,s} B^{q,s})\alpha_t \text{ or } \theta_p(B)\Phi_p(B^s)\bar{V}^d \bar{V}_x^D Z_t = \theta_q(B)\, \theta_Q(B^s)\alpha_t \tag{11}$$

One recognizes seasonal components by an examination of the autocorrelation and partial autocorrelation function estimates. That is, the autocorrelation and partial autocorrelation function estimates should have significantly large values at lags one and twelve as well as smaller (but statistically significant) values at lag 13 for monthly data.[11] One seasonally differences the data (a twelfth order seasonal difference for monthly data and estimates the seasonal AR or MA parameters.) A random walk with drift model with a monthly component may be written as

$$\bar{V}\bar{V}_{12} Z_t = (1 - B)(1 - \theta B^{12})\alpha_t \tag{12}$$

The multiplicative form of the (0,1,1) X (0,1,1)12 model has a moving average operator that may be written as

$$(1 - \theta B)(1 - \theta B^{12}) = 1 - \theta B - \theta B^{12} + \theta B^{13}$$

The random walk with drift with the monthly seasonal adjustments is the basis of the “airline model” in honor of the analysis by Professors Box and Jenkins of total airline passengers during the 1949-1960 period.[12] The airline passenger data analysis employed the natural logarithmic transformation.

There are several tests and procedures that are available for checking the adequacy of fitted time series models. The most widely used test is the Box-Pierce test, where one examines the autocorrelation among residuals, α_t:

$$\hat{v}_k = \frac{t = \sum_{k+1}^{n} \alpha_t \alpha_{t-k}}{\sum_{t=1}^{n} \alpha_t^2}, k = 1, 2, \ldots$$

The test statistic, Q, should be X^2 distributed with (m-p-q) degrees of freedom.

$$Q = n \sum_{k=1}^{m} \hat{v}_k^2 .$$

The Ljung-Box statistic is a variation on the Box-Pierce statistic and the Ljung-Box Q statistic tends to produce significance levels closer to the asymptotic levels than the Box-Pierce statistic for first-order moving average processes. The Ljung-Box statistic, the model adequacy check reported in the SAS system, can be written as

$$\text{Q} = \text{n(n+2)} \sum_{k=1}^{m} (n = k)^{-1} \hat{v}_k^2 . \tag{13}$$

Residual plots are generally useful in examining model adequacy; such plots may identify outliers as we noted in the chapter. The normalized cumulative periodogram of residuals should be examined.

Granger and Newbold (1977) and McCracken (2002) use several criteria to evaluate the effectiveness of the forecasts with respect to the forecast errors. In this chapter, we use the root mean square error (RMSE) criteria. One seeks to minimize the square root of the sum of the absolute value of the forecast errors squared. That is, we calculate the absolute value of the forecast error, square the error, sum the squared errors, divided by the number of forecast periods, and take the square root of the resulting calculation. Intuitively, one seeks to minimize the forecast errors. The absolute value of the forecast errors is important because if one calculated only a mean error, a 5 percent positive error could “cancel out” a 5 percent negative error. Thus, we minimize the out-of-sample forecast errors. We need a benchmark for forecast error evaluation. An accepted benchmark [Mincer and Zarnowitz (1969)] for forecast evaluation is a no-change, NoCH. A forecasting model should produce a lower root mean square error (RMSE) than the no-change model. If several models are tested, the lowest RMSE model is preferred.

In the world of business and statistics, one often speaks of autoregressive, moving average, and random walk with drift models, or processes, as we have just introduced.

It is well known that the majority of economic series, including real Gross National Product (GDP) in the U.S., follow a random walk with drift, and are represented with autoregressive integrated moving average (ARIMA) model with a first-order moving average operator applied to the first-difference of the data. The data is differenced to produce stationary, where a process has a (finite) mean and variance that do not change over time and the covariance between data points of two series depends upon the distance between the data points, not on the time itself. The RWD process, estimated with an ARIMA (0,1,1) model, is approximately equal to a first-order exponential smoothing model [Cogger (1974)]. The random walk with drift model has been supported by the work of Nelson and Plosser (1982).

In a transfer function model, one models the dynamic relationship between the deviations of input X and output Y. One is concerned with estimating the delay between the input and output. The set of weights is often referred to as the impulse response function.

$$Y_t = V_0 \tilde{X}_t + V_1 \tilde{X}_{t-1} + V_2 \tilde{X}_{t-2} \quad (14)$$

$$= V(B) \tilde{X}_t \quad (15)$$

3. LEADING ECONOMIC INDICATORS (LEI) AND REAL GDP ANALYSIS: THE STATISTICAL EVIDENCE, 1970-2002

We introduce the time series modeling process in this study because we will use The Conference Board U.S. composite leading economic indicator as an input to a transfer function model of U.S. real GDP, both series being first-differenced and log-transformed. The authors test the null hypothesis that there is no statistical association between changes in the logged leading economic indicators and changes in logged real GDP in the U.S. A positive and statistically significant coefficient indicates that the leading indicator composite series is associated with rising real output, and leads to the rejection of the null hypothesis.

Zarnowitz (1992) examined the determinants of Real GDP, 1953-1982 using VAR models. In this analysis, we test the statistical significance of the Conference Board leading economic indicators (LEI) by adding the lags of the variable to an AR(1) model. Does the knowledge of the leading economic indicator help forecast future changes in GDP, and can past values of the GDP data predict the future growth of GDP? In a recent study of univariate and time series model post-sample forecasting, Thomakos and Guerard (2001) compared RWD and transfer -function models with no-change forecasts using rolling one-period-ahead post-sample periods. Guerard (2001) found that the AR (1) and random walk with drift processes are adequate representations of the time series process of real GDP, given the lags of the autocorrelation and partial autocorrelation functions. Guerard (2001) reported the estimated cross-correlation functions between the G7 respective LEI and real GDP for the 1970-2000 period, and found that the resulting transfer function models were statistically significant in forecasting real GDP in the G7 nations.

In this chapter, the authors report the estimated autocorrelation and partial autocorrelation functions of U.S. real GDP, 1963- March 2002, shown in Table 1. Let us look at Table 1, the estimated autocorrelation and partial autocorrelations functions of real quarterly U.S. GDP, March 1963-March 2002. The estimated autocorrelation function decays gradually, falling from 0.979 for a one period (quarter lag), 0.958 for a two quarter lag, to 0.584 for a twenty quarter lag, and 0.318 for a 36 quarter lag. The estimated partial autocorrelation function is characterized by the “spike” at a one quarter lag. The first estimated partial autocorrelation is 0.979, and the second partial autocorrelation is -.005. The U.S. real GDP series can be estimated as a random walk with drift series for the 1963-2002 period. The estimated functions substantiate the estimation of the first-order moving average operator of the first-differenced, log-transformed U.S. real GDP series, denoted RWD, shown in Table 2. Guerard (2001) used an autoregressive variation of the random walk with drift model as a forecasting benchmark. The residuals of the RWD model show few deviations from normality. The RWD is a statistically adequately fitted model. We estimate the cross-correlation function of the LEI and real GDP for an initial 32 quarter estimation period, following Thomakos and Guerard (2001), and uses the 1978-March 2002 period for initial U.S. post-sample evaluation. Similar estimations are derived for real GDP series in France (FR), Germany (GY), and the U.K. See Table 3. The leading economic indicators are statistically significantly associated with real GDP in the respective countries during the 1978-2002 period, as are shown in the respective GDP regressions in Table 3. The lag structures of the models were discussed in Guerard (2001), and we refer the reader to the initial modeling and forecasting analysis. The statistical significance of the transfer functions in Table 3 leads one to reject the null hypothesis of no statistical association changes in the leading economic indicators and changes in real GDP. The statistically significant lags in the cross-correlation functions show how past values of the LEI series are associated with the current values of the respective real GDP. That is, the LEI series lead their respective real GDP series and can be used as inputs to transfer function models of real GDP. The multiple regressions of the post-sample period are generally statistically significant at the 1 percent level, as shown by their respective F-statistics of the regressions. The exception to this result is the French real GDP estimate, see Table 3, that is significant at approximately the 5 percent level. Thus, the estimation of the transfer function is statistically significant relative to simply using an AR (1) time series model.

4. LEADING U.S. AND G7 POST-SAMPLE REAL GDP FORECASTING ANALYSIS

In this section, the author estimates several time series models for the U.S. leading indicators and Real GDP, and corresponding models for the G7 nations. A simple autoregressive variation on the random walk model, an ARIMA (1,1,0), is estimated to serve as a naïve, forecasting model. The ARIMA model is referred to as the RWD Model. The transfer function model uses the LEI series as the input to the Real GDP (output) series. We will evaluate the forecasting performances of the models with respect to their root mean square error (RMSE), defined as the square root of the sum of the individual observation forecast errors squared. The most accurate forecast will have the smallest forecast error squared and hence the smallest RMSE. The RMSE criteria are proportional to the average squared error criteria used in Granger and Newbold (1977). One can estimate models using 32 quarters of data and forecast one-step-ahead. We compare the forecasting accuracy of four models of U.S. real GDP. The models tested are: (1) the transfer function model in which The Conference Board composite index of leading economic indicators (LEI) is lagged three quarters, denoted TF; (2) a no-change (NoCH) forecast; (3) the simple RWD model; and (4) a simple transfer function model in which The Conference Board composite index of leading economic indicators is lagged one period, denoted TF1. One finds that the three-quarter of lagged LEI transfer function is the most accurate out-of-sample forecasting model for the U.S. real GDP; although there is no statistically significant differences in the rolling one-period-ahead root mean square forecasting errors of the RWD, TF, and TF1 models.

Table 1. Correlogram of USGDP

Date: 05/09/03 Time: 14:28
Sample: 1 158
Included observations: 157

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.979	0.979	153.31	0.000
		2	0.958	-0.005	301.09	0.000
		3	0.937	-0.010	443.41	0.000
		4	0.916	-0.024	580.18	0.000
		5	0.894	-0.024	711.33	0.000
		6	0.871	-0.022	836.82	0.000
		7	0.849	-0.015	956.70	0.000
		8	0.826	-0.021	1071.0	0.000
		9	0.804	0.003	1179.9	0.000
		10	0.781	-0.011	1283.6	0.000
		11	0.760	0.008	1382.4	0.000
		12	0.739	0.004	1476.5	0.000
		13	0.719	-0.005	1566.1	0.000
		14	0.699	-0.011	1651.3	0.000
		15	0.679	0.002	1732.4	0.000
		16	0.660	-0.004	1809.4	0.000
		17	0.640	-0.012	1882.4	0.000
		18	0.621	-0.003	1951.7	0.000
		19	0.602	-0.011	2017.4	0.000
		20	0.584	-0.006	2079.4	0.000
		21	0.566	0.004	2138.2	0.000
		22	0.548	-0.001	2193.7	0.000
		23	0.531	-0.004	2246.2	0.000
		24	0.514	-0.013	2295.7	0.000
		25	0.497	0.005	2342.4	0.000
		26	0.480	-0.010	2386.4	0.000
		27	0.464	-0.007	2427.7	0.000
		28	0.448	-0.013	2466.5	0.000
		29	0.431	-0.018	2502.7	0.000
		30	0.414	-0.016	2536.4	0.000
		31	0.397	-0.001	2567.7	0.000
		32	0.381	-0.020	2596.6	0.000
		33	0.365	0.008	2623.3	0.000
		34	0.349	-0.008	2648.0	0.000
		35	0.333	0.001	2670.7	0.000
		36	0.318	-0.013	2691.5	0.000

Table 2. Random Walk with Drift Time Series Model of Real U.S. GDP

Dependent Variable: DLUSGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.008	0.0001	8.149	0.000
MA(1)	0.218	0.087	2.507	0.013
R-squared	0.061			
Adjusted R-squared	0.053			
S.E. of regression	0.0086	Akaike info criterion		-6.6575
Sum squared resid	0.0093	Schwarz criterion		-6.6129
Log likelihood	428.08	F-statistic		8.1570
Durbin-Watson stat	1.92	Prob(F-statistic)		0.0050

Table 3. Post-Sample Regression Coefficients of the Leading Economic Indicators, 1978-March 2002

Country	Const.	LEI (-1)	LEI (-2)	LEI (-3)	LEI (-4)	AR (1)	Adj. R-sq.	F-Stat.
US	0.005	0.337	0.060	0.141		0.053	0.283	10.400
(t)	7.200	4.800	0.890	2.130		0.480		
UK	0.005			0.214		-0.166	0.088	5.600
	7.500			2.610		-2.300		
Germany	0.004	0.242		0.211		-0.250	0.102	4.610
	5.750	2.610		2.370		-2.300		
France	0.004		0.140	0.133	-0.064	0.038	0.058	2.470
	7.960		1.930	1.870	-0.910	0.360		
Japan	0.005	0.217				-0.437	0.174	11.030
	5.860	2.900				-4.660		
Canada	0.008		0.306	0.036	-0.263	0.150	0.240	3.290
	4.880		2.340	0.270	-2.100	0.640		
Italy	0.004		0.132	-0.089	-0.009	-0.050	0.059	1.460
	4.670		2.260	-1.480	-1.490	-0.240		

The one-period-ahead quarterly RMSE for the 1978- March 2002 period of Real GDP are:

Table 4. Post-Sample Accuracy of U.S. Real GDP Models

Using The Conference Board LEI in the Transfer Function Model

Model	RMSE
No-Change	0.0117
RWD	0.0086
TF1	0.0080
TF	0.0079

Thus, the U.S. leading indicators lead Real GDP, as one should expect, and the transfer function model produces lower forecast errors than the univariate model, and a naive benchmark, the no-change model. The reader notes that the transfer function model uses a one-quarter lag produces forecasts that are not statistically different from the three-quarter lags suggested from the estimated cross-correlation function.

The model forecast errors are not statistically different (the t-value of the paired differences of the univariate and TF models is 0.91). An analysis of the rolling one-period-ahead RMSE produces somewhat different results for post-sample modeling than the use of one long period of post-sample period. The multiple regression models indicate statistical significance in the U.S. composite index of leading economic indicators for the 1978-March 2002 period. One does not find that the transfer function model forecast errors are (statistically) significantly lower than univariate ARIMA model (RWD) errors in a rolling one-period-ahead analysis. The authors prefer to measure forecasting performance in the rolling period manner (as we often live in a one-period-ahead forecasting regime).

The RMSE of the G7 nations cast doubt as to the effective of the leading economic indicators as a statistically significant input in transfer function models forecasting real GDP. Transfer function model forecasts of real GDP, using The Conference Board (TB), do not significantly reduce RMSE relative to the RWD model forecasts during the 1978-March 2002 period. Please see Table 5.

One may ask why 32 observations were used; why not use 60 observations of past real GDP to estimate the models. If one sought to minimize the forecasting error from 1982 to June 2002, and one varied the estimation modeling periods, one finds that the 32-quarter estimation is quite reasonable, see Table 6. The 40 and 44-quarter estimation periods produce the lowest real RMSE, although the differences are not statistically significant.

Table 5. Post-Sample Accuracy of Real GDP Models
Using TCB LEIs in the Transfer Function Model

Nation	Model	Input Source	RMSE
GR	NoCH		0.0114
	RWD		0.0109
	TF	TCB	0.0106
FR	NoCH		0.0081
	RWD		0.0065
	TF	TCB	0.0070
JP	NoCH		0.0177
	RWD		0.0152
	TF	TCB	0.0163
U.K.	NoCH		0.0106
	RWD		0.0090
	TF	TCB	0.0089

Table 6. Post-Sample Root Mean Square Errors of real U.S. GDP, 1982-2002

Estimation Modeling Periods	RMSE
32	5.31
36	5.18
40	5.19
44	4.99
48	4.99
52	5.03
56	5.05
60	5.08
NoCh	8.09

5. QUARTERLY EARNINGS PER SHARE MODELING

Earlier this chapter traced the development and estimation techniques of the Box and Jenkins time series models. One can estimate a seasonal version of the Box and Jenkins airline model to forecast earnings per share for DuPont, Dominion Resources, and IBM. Quarterly earnings per share (eps) models can be estimated using data from the Wharton Research Data Services (WRDS) for these companies during the 1962-June 2003 period. This section estimates several versions of time series models, including the quarterly version of the airline model, and compared to a no-change forecast.

Annual eps changes are held to be random [Little (1962)]. Thus, one could estimate a random walk with drift model, an ARIMA (0,1,1) process, to forecast eps. One could estimate a quarterly version of the random walk with drift process, an ARIMA (0,1,1) x (0,1,4) process. One creates a seasonal difference and estimates a seasonal moving average term (MA) at lag 4, in additional to the basic random walk with drift framework. Box and Jenkins advocated using 30-60 observations to estimate time series modes. To forecast quarterly eps, one can use 20 and 40 observations. The reader may ask why 20 observations, given the very low number of degrees of freedom.

6. SUEs

In 1977, Latané and Jones reported the effectiveness of a quadratic regression model using 20 observations to forecast quarterly eps, Latané and Jones used the following model to predict earnings:

$$EPS_t = a_0 + a_1 \text{ Time}_t + a_2 \text{ Time Squared}_t + a_3 \text{ DUM1}_t + a_4 \text{ DUM2}_t + a_5 \text{ DUM3}_t + e_t$$

where Time = a count variable for time; ie. 1-20,
Time-Squared = the Time Variable Squared,
DUM1 = a seasonal dummy variable for quarter 1;
DUM 1 = 1 if quarter 1,0.

Otherwise,

DUM2 = a seasonal dummy variable for quarter 2,
DUM3 = a seasonal dummy variable for quarter 3.
and e_t = randomly distributed error term.

Latané and Jones' forecast simply incremented time to 21, time squared to 441, and used the approximate quarter seasonal dummy variable. The regression forecast, fore, and the standard error of the regression, se, (the reader is referred back to Chapter 12), can be compared to the actual announced earnings, ACT, and a statistic, the Standardized Unexpected Earnings, SUE, derived by:

$$SUE_t = \frac{Act_t - Fore_t}{se}$$

A positive SUE means that the actual announced exceeded the regression forecast. One prefers positive SUEs. A negative SUE represents an earnings short fall. Latané and Jones used the regression standard error to create a normalized variable. One should purchase securities with SUEs exceeding 2.0, and short securities with SUEs < -2.0. Let us look at the intuition of the SUE statistic. If a quarterly eps is announced of $.45, whereas the regression model had a forecast of $.40, there is a positive forecast error. However, if the regression standard error is .05, the SUE is 1.0, whereas if the standard error was .02, then the SUE would be 2.50, and one should purchase the security. One purchases stocks with positive earnings surprises (forecast errors) and smaller standard error. The SUEs are often calculated by consensus analysts' forecasts and standard errors of the analysts, but the SUE framework is consistent. There are 158 quarters of eps data in the WRDS database for DD, D, and IBM. If we estimated ARMA (1,1) processes with the data, one would obtain the coefficients should in Table 7. The AR (1) terms are near unity, as one would expect in a near-random walk series, and the MA (1) terms are statistically significant. The overall F-statistics indicate that the models are adequately fitted. The corresponding SUE regressions are shown in Table 8 for the entire period. One notes that the SUE F-statistics are lower than the Box and Jenkins ARMA models. Furthermore, only Dominion Resources (D) would appear to have statistically significant seasonality. The seasonal quarterly regression dummy variables, Dummy 1, Dummy 2, and Dummy 3, are not statistically significant (| t | < z), for DuPont and IBM. The t-statistics of the rolling 20-period SUE estimations for D are shown in Chart 1 and significant seasonality is indeed present.

One can compare rolling 20 and 40 period ARIMA model estimations with the no-change and SUE benchmarks in Table 9. One finds that the root mean square errors, RMSE, of the ARMA processes using 40 observations are lower (lower RMSE's) than those using 20 observations. One can rank the RMSE of each firm from lowest (1=best) to highest (8=worse) and sum them for the three securities. The best model for the three firms is the random walk with drift using 40 observations (SUM of RMSE is 8) whereas the ARTMA (1,1) and seasonal RWD are tied for second place. The Latané and Jones model is in the middle of the models, most of which beat the no-change (NoCH), forecast. The time series models with 40 observations produced lower forecast errors than the SUE and no-change models for the three firms.

Table 7. Estimated ARMA Models

Firm	Constant	AR(1)	MA(1)	$\overline{R}^2$	F
DD	1.475	.901	-.668	.216	22.52
(t)	(4.53)	(14.85)	(-6.55)		
D	.696	.972	-.866	.195	19.92
	(4.89)	(38.18)	(-15.15)		
IBM	1.927	.889	-.576	.311	36.26
	(3.47)	(15.47)	(-5.64)		

Table 8. Estimated Quadratic Regression Models

Firm	Constant	Time	Time-Squared	Dummy 1	Dummy 2	Dummy 3	$\overline{R}^2$	F
DD	2.270	-.002	-.000	-.130	.139	.030	.148	6.44
(t)	(6.65)	(-.27)	(-1.12)	(-.48)	(0.51)	(0.11)		
D	.179	.009	-.001	.142	-.082	.385	.295	14.11
	(2.00)	(3.79)	(-2.82)	(1.97)	(-1.14)	(5.05)		
IBM	3.700	-.009	-.000	-.421	-.690	-.549	.137	6.00
	(6.60)	(-.69)	(-.62)	(-.93)	(-1.54)	(-1.21)		

Table 9. Root Mean-Squared Error Analysis

Model	Rank MSE	DD	Rank MSE	D	Rank MSE	IBM	Rank MSE Total
NoCH	4	1.702	8	0.599	6	2.559	18
RWD20	5	1.722	6	0.420	1	2.344	12
SRWD 20	8	2.107	6	0.420	8	2.676	22
RWD 40	2	1.568	4	0.395	2	2.350	8
SRWD 40	6	1.735	1	.0344	3	2.473	10
SUE	3	1.641	2	0.357	7	2.642	12
ARMA 20	7	2.030	3	.0371	5	2.544	15
ARMA 40	1	1.548	5	0.399	4	2.517	10

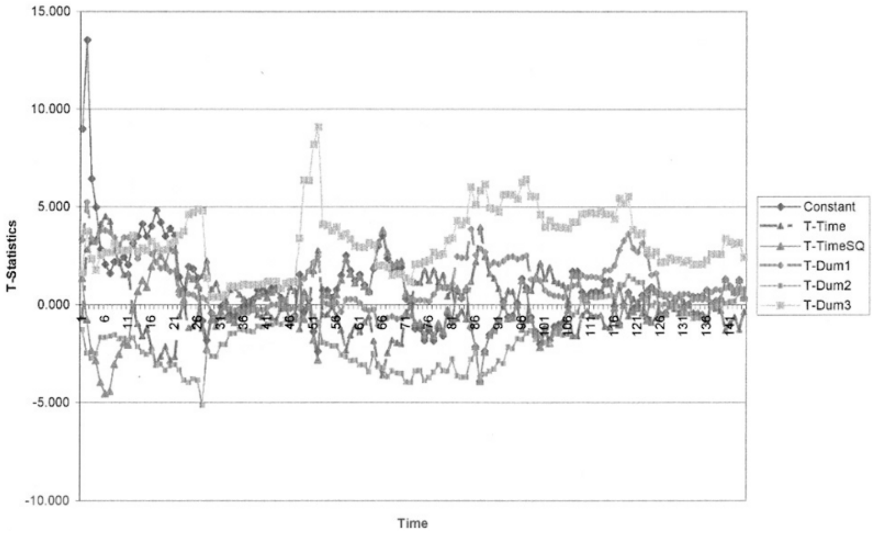

Figure 1. T-statistics of Dominion Resources SUE Model

7. *PRO FORMA* ANALYSIS

The reader has been presented with primary approaches to forecasting, the estimation of regression and time series models. Let us use regression models to forecast sales of DuPont, Dominion Resources, and IBM. We compare regression models using time and quadratic time terms, as we did in the earnings per share (eps) example of the previous section, with average annual growth rate calculations to forecast sales. We then calculate the initial new capital needs, or external funds needed, of the firms. We point out why forecasting sales is very difficult and how *pro forma*, or projected financial statements, may be affected by the sales forecast. When one forecasts sales and earnings per share, one is almost always not correct. One seeks to predict the rate of direction of the change in sales and earnings, and minimize the squared errors of the forecasts, as was done in the previous two chapters.

8. FORECASTING WITH AN AVERAGE ANNUAL GROWTH RATE

Assume that the current date is June 2002, and one knows annual sales, income statements, and balance sheets for fiscal year 2001. We are interested in forecasting sales and new external funds needed fore the current fiscal year, 2002, ending in December 2002. The sales histories of our three firms (DD, D, and IBM) in Figure 1 for the 1958-2001 period. Additionally, we have the history of the corresponding composite index of leading economic indicators (LEI). The reader is reminded of our regression and transfer modeling uses of the leading economic indicators in Chapter 12 and the earlier section of this Chapter.

The first and easiest forecasting technique is the calculation of the average annual growth rate, g. The average annual growth rate requires little data, only the first and final data points. In the case of DuPont, the average annual growth rate may be calculated as:

$$g = \sqrt[43]{\frac{\text{sales } 2001}{\text{sales } 1958}} - 1$$

$$= \sqrt[43]{\frac{\$25{,}106}{\$1{,}859}} - 1 \quad = .0625$$

We use the 43rd root of the radical because they have 43 years of growth (difference). DuPont has averaged an average annual growth of 6.25 percent in sales over the 1958-2001 period. We can forecast DuPont's sales in 2002 as \$25,106 (1.0625) = \$26,675.1. The corresponding growth rates for D and IBM are 10.60 and 10.52 percent, respectively.

Table 10. Average Annual Growth Calculations and Forecasts of DD, D, and IBM (\$ Millions)

Sales			Sales Forecasts	
Firm	1958	2001	G	2002
DD	\$ 1,859	\$25,106	.0625	\$26,675.1
D	139.7	10,558	.1060	11,677.1
IBM	11,718	85,866	.1052	94,899.1

The growth rate calculation is certainly easy enough.

9. REGRESSION FORECASTING OF SALES

A multiple regression model in which sales is a function of time and time-squared, a quadratic term. The multiple regression analysis of DD, D, and IBM sales is shown in Table 11.

Table 11. Multiple Regression Models of Sales

Firm	Constant	Time	Time-Squared	$\overline{R}^2$	F
DD	-6756.3	1330.0	-7.372	.774	74.7
(t)	(-2.07)	(3.99)	(-1.02)		
D	504.2	-87.45	5.882	.924	282.5
	(1.53)	(-2.59)	(8.08)		
IBM	-3405.9	569.1	37.96	.974	814.9
	(-1.49)	(2.42)	(7.50)		

DuPont's sales are statistically significant, and linear in time (only Time is significant). IBM's sales increase exponentially with time (positively) whereas Dominion Resources' increase in time linearly (Time) and exponentially (Time Squared). The sales forecasting models are highly statistically significant, as one sees from the adjusted R-squared and F-statistics. The sales forecasts for DD, D, and IBM, in 2002 are calculated using setting time to 45 and time-squared to 2025 (45 x 45), and solving, as in the case of DuPont:

$$DD_{sales} = -6756.3 + 1330.0(45) - 7.372(2025)$$
$$= \$38,165.4$$

The corresponding sales forecasts for Dominion Resources and IBM are \$8482.3 and \$99,078.6, respectively. One notes that the quadratic regression sales forecasts are quite larger than the current level of sales for DuPont and IBM. The reader may be inclined to be excited about either forecast, given that there has been no consideration of business conditions in these forecasts. We can include the leading economic indicators, LEI in a multiple regression, although the variable which is statistically significant in forecasting real GDP (shown in Chapter 12), is not significantly associated with DD, D, and IBM sales.

Table 12. LEI Regression Models

Firm	Constant	Time	Time-Squared	LEI	F
DD	25,857.8	1865.9	-5.01	-551.7	52.6
(t)	(1.26)	(3.99)	(-.69)	(-1.62)	
D	-598.0	-105.6	5.803	18.644	172.0
	(-.30)	(-2.18)	(7.73)	(0.53)	
IBM	-9635.0	466.8	37.51	105.4	532.5
	(-.70)	(1.39)	(7.18)	(0.42)	

The LEI variable is not statistically significant, and the F-statistics of the multiple regression models decline relative to the quadratic regression models shown in Table 11.

Let us now use the average annual growth rate in sales and its corresponding forecasts to create *pro forma* statements and estimated capital needs. We can create a projected balance sheet (and forecasted net income) by using a percentage of sales method. One assumes in this approach that current assets and current liabilities rise as a percentage of sales, but fixed assets and long-term debt are constant. Common equity increases by the amount that net-income exceeds dividends. The increase in equity is, of course, due to the increase in retained earnings. One needs to make several assumptions to create *pro forma* statements. First, we can calculate the ratios of current assets-to-sales and current liabilities-to-sales based on the most recently reported balance sheet, in year 2001. For many firms, these ratios are relatively constant. A far more volatile ratio is the net income-to-sales ratio. One can calculate the net income-to-sales ratios for our firms during the 1995-2001 period.

Table 13. Profit Margins of D, DD, and IBM

Year	Firms		
	DD	D	IBM
1995	.090	.101	.058
1996	.094	.105	.071
1997	.060	.057	.078
1998	.066	.094	.077
1999	.008	.100	.088
2000	.081	.045	.092
2001	.172	.052	.090
Average	.082	.079	.079

One can use an approximate average profit margin, or net income-to-sales ratio, of .08, or eight percent. The DD, D, and IBM current assets-to-sales and current liabilities-to-sales ratios are 0.54 and 0.32 (DD), 0.51 and 0.71 (D), and 0.50 and 0.41 (IBM), respectively. One can assume fixed assets and long-term debt are constant. Dominion Resources eliminated its dividends in 2000, and DuPont's dividends to-net income ratio is very unstable, ranging from 36 percent to over 650 percent. A reasonable assumption for DuPont is that it will maintain its dividends of $1455 million. IBM maintains approximately a 14 percent dividend payout ratio. Thus, based on a sales forecast derived from an average annual growth rate during the 1958-2001 period, and an eight percent profit margin, one may forecast sales, net income, and dividends for our firms in 2002.

Table 14. Forecasted Sales, Net Income, and Dividends of DD, D, and IBM for 2002 ($ Millions)

Firm	2002 Sales	Net Income	Dividends
DD	$26,675.1	2134.0	1455.0
D	11,677.1	934.0	0.0
IBM	94,899.1	7591.9	956

One can use the most recently-reported current assets-to-sales and current liabilities-to-sales ratios to forecast values for 2002, shown in Table 15.

Table 15. 2002 *Pro Forma* Statements of DD, D, and IBM for 2002 ($ Millions)

	DD	D	IBM
Current Assets	14,404.6	5920.3	46,500.6
Fixed Assets	26,854	29,015	46,661
Total Assets	41,258.6	34,935	93,161.6
Current Liabilities	8536.0	5853.3	38,908.6
Long-Term Debt	5350.0	13,251.0	15,963.0
Equity	14,894.0	9302.0	
EFN	12,478.6	6529.0	8040.1
Total Liabilities and Equity	41,258.6	34,935	93,161.6

The reader notes that external funds needed, EFN, or the estimate of the firm's capital needs, is a residual. The *pro forma* statements must balance, and the EFN is the item creating the balance. A positive EFN, the case for all of our firms, implies that the firm must issue debt or equity to finance its growth. The choice of debt or equity may be made by calculating the earnings per share (eps) of both options, and maximizing the eps, or by maintaining a targeted capital structure.

One should ask how accurate the sales forecasts were, with the two simplistic techniques.

Firm	2002 Sales	g	Quadratic Regression
DD	$24,134	$26,675.1	$38,165.4
D	10,218	11,677.1	8,482.3
IBM	81,186	94,899.1	99,078.6

The average annual growth sales forecasts were more accurate than the quadratic regression model forecasts in forecasting 2002 sales for our three firms.

10. SUMMARY

This chapter examined the predictive information in The Conference Board leading economic indicators (LEI) for the U.S., U.K., Japan, and France. We find that The Conference Board LEI and FIBER short-term leading economic indictors are statistically significant in modeling the respective real GDP changes during the 1970-2000. One rejects the null hypothesis of no association between changes in the leading economic indicators and changes in real GDP in the U.S., and the G7 nations. If one uses a rolling 32 quarter estimation period and a one-period-ahead forecasting root mean square error calculation, the leading economic indicator forecasting errors are not significantly lower than the univariate ARIMA model forecasts. Similar forecasting analysis on quarterly earnings per share for DuPont, Dominion Resources, and IBM. Time series models produced lower root mean square errors than did regression-based modeling. The reader sees the costs and benefits of regression and time series modeling and forecasting, as compared to the average annual sales growth rate in forecasting sales, constructing pro forma statements, and determining the firm's capital needs.

Notes

[1]Section 2 can be omitted with little loss of continuity with readers more interested in the application of time series models.

[2]This section draws heavily from Box and Jenkins, *Time Series Analysis*, Chapters 2 and 3.

[3]Please see Box and Jenkins, *Time Series Analysis*, Chapter 3, for the most complete discussion of the ARMA (p,q) models.

[4]A stationary AR(p) process can be expressed as an infinite weighted sum of the previous shock variables

$$\tilde{Z}_t = \phi^{-1}(B)\alpha_t.$$

In an invertible time series, the current shock variable may be expressed as an infinite weighted sum of the previous values of the series

$$\theta^{-1}(B)\tilde{Z}_t = \alpha_t.$$

[5]Box and Jenkins, *Time Series Analysis*. Chapter 6; C.W.J. Granger and Paul Newbold, *Forecasting Economic Time Series*. Second Edition (New York: Academic Press, 1986), pp. 109-110, 115-117, 206.

[6]Granger and Newbo1d, *Forecasting Economic Time Series*. pp. 185-186.

[7]Box and Jenkins, *Time Series Analysis*. pp. 173-179.

[8]G.E. Box and D.R. Cox, "An Analysis of Transformations," *Journal of the Royal Statistical Society*, B 26 (1964), 211-243.

[9]G.M. Jenkins, "Practical Experience with Modeling and Forecasting Time Series," *Forecasting* (Amsterdam: North-Holland Publishing Company, 1979).

[10]Jenkins, *op. cit.,* pp. 135-138.

[11]Box and Jenkins, *Time Series Analysis*, pp. 305-308.

[12]Box and Jenkins, *op. cit.*

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Problem

1. Management is concerned with its sales, net income, and new capital needs during the coming two years. Mr. X, calculating a sales growth rate of 6.67 %, and a profit margin of 10 percent, believes that no new capital will be needed. Ms Y, has calculated a sales growth rate of 5.24%, and sees positive EFN. Furthermore, Ms Y believes that EPS is maximized with debt issuance. Who is correct?

Sales, 1993,	$15,000,000
Sales, 2003,	$25,000,000
Net Income, 2003	2, 499,999
Dividends, 2003	1,000,000
Shares Outstanding	1,000,000
Stock Price	$50
Tax rate	35%
Current Assets	$10,000,000
Total Assets	12,500,000
Current Liabilities	7,500,000
Long-Term Debt	1,500,000
Stockholder Equity	3,500,000

Chapter 14

RISK AND RETURN ON EQUITY AND THE CAPITAL ASSET PRICING MODEL

Individual investors must be compensated for bearing risk. It seems intuitive that there should be a direct linkage between the risk of a security and its rate of return. Overall investors should be interested in securing the maximum return for a given level of risk, or the minimum risk for a given level of return. The concept of such risk-return analysis is the efficient frontier of Harry Markowitz (1952, 1959). If an investor can invest in a government security, which is backed by the taxing power of the Federal Government, then that government security is relatively risk-free. The 90-day Treasury bill rate is used as the basic risk-free rate. Supposedly the taxing power of the Federal government eliminates default risk of government debt issues. A liquidity premium is paid for longer-term maturities, due to the increasing level of interest rate risk. Investors are paid interest payments, as determined by the bond's coupon rate, and may earn market price appreciation on longer bonds if market rates fall or losses vice versa. During the period from 1926-2003, Treasury bills returned 3.69 percent, longer-term government bonds earned 5.28 percent, corporate bonds yielded 5.99 percent, and corporate stocks, as measured by the stock of the S&P 500 index, earned 11.84 percent annually. Small stocks averaged a 16.22 percent return, annually, over the corresponding period. The annualized standard deviations are 1.00, 19.48, and 29.66 percent, respectively, for Treasury bills, stocks (S&P), and small stocks. The risk-return trade off has been relevant for the 1926-2003 period.[1] Why do corporate stocks offer investors such returns?

First, as a stockholder, one owns a fraction, a very small fraction for many investors, of the firm. When one owns stocks, one is paid a dividend and earns stock price appreciation. That is, an investor buys stock when he or she expects its stock price to rise, and compensate the investor for bearing the risk of the stock's price movements. Investors have become aware in recent years that not all price movements are in positive directions. One can calculate returns on stocks with several different methods.

1. CALCULATING HOLDING PERIOD RETURNS

A very simple concept is the holding period return (HPR) calculation, in which one assumes that the stock was purchased at last (period's) year's price and the investor earns a dividend per share for the current year and a price, appreciation (depreciation) relative to last years price.

$$HPR_t = \frac{D_t + P_t - P_{t-1}}{P_{t-1}}$$

where D_t = current year's dividend,
P_t = current year's stock price,
P_{t-1} = last year's stock price
and HPR_t = current year's holding period return.

The assumption of annual returns is arbitrary, but well-known in finance. Markowitz (1959) used annual returns in his Chapter 2 of *Portfolio Selection* to illustrate holding period returns and investment in the long-run. Let us examine three widely held stocks: DuPont, Dominion Resources, and IBM, for 1994-2003 period. The pricing data is taken from the Standard & Poor's *Stock Guide*. The *S&P Stock Guide* presents high and low prices during the calendar year. An average price (AvgP) can be calculated by simply summing the high and low prices and dividing by two. The average price calculations for DuPont, Dominion Resources, and IBM are shown in Table 1. Changes in annual average prices create much of the variability in annual HPRs. For example, in 1995, the average price of IBM rose from \$15.97, in 1994, to \$23.11. The \$7.14 price appreciation leads to an annual return of 46.29 percent.

$$\text{IBM } HPR_{1995} = \frac{\$.25 + \$23.11 - \$15.965}{\$15.965} = .4629$$

The price movement of IBM in 1995 was slightly higher than DuPont's gain of \$3.76, or 13.56%, on a \$27.65 base. Dominion Resources' price fell in 1995, falling \$1.87 on a \$40.12 investment, or a loss of some 4.67 percent. The IBM holding period returns (HPRs) were consistently positive and rather large during the 1995-1999 period. The reader sees that the HPRs of stocks are often far more dependent upon stock price movements than the dividends received by investors. The HPRs of DuPont range from 40.35% in 1997 to -23.94% in 1002. One can estimate an expected return for DuPont by calculating the mean value of the annual HPRs during the 1995-2003 period. The expected return for DuPont during the 1995-2003 period was 9.50 percent, with a standard deviation of 21.40 percent. If the annual HPRs of DuPont are normally distributed, that is, the returns fall within the normal "Bell" curve, then approximately 68.3 percent of the annual observations of DuPont returns should fall within the -11.90 and 30.90 range (one standard deviations). The reader immediately sees how wide the one standard deviation range is for annual returns. We can calculate in a similar manner the expected returns for IBM and Dominion Resources. One sees that the returns are extremely volatile for IBM, having a standard deviation of 30.00 percent. It may be worthwhile to calculate a coefficient of variation (CV) in which the standard deviation is divided by the expected return. The calculation of the CV leads the investor to recognize that DuPont, more than IBM or Dominion Resources, produces greater variation for a given level of expected returns.

Security	Ticker	E(R)	σ	CV
DuPont	DD	.095	.214	2.253
Dominion Resources	D	.110	.137	1.245
IBM	IBM	.242	.300	1.240

Note that the calculations of expected returns and standard deviations allow the investor to allocate scarce resources on the basis of historic returns and risk. An investor should not allocate resources to only one security, as was the case with many Enron stockholders. Remember your grandmother's expression, "Do not put all of your eggs in one basket." Clearly the standard deviation of return may be minimized by investing in several assets, particularly if these assets are somewhat uncorrelated. An investor does not benefit from investing in two stocks, as opposed to only one security, if both stocks move in parallel. That is, if stock A rises 10 percent and stock B rises 10 percent, then it is not evident that the investor has any benefits to a second stock investment. However, if Dupont has an expected return of 9.5 percent and IBM has an expected return of 24.20 percent, an investor can purchase an equal dollar amount of each stock and reduce risk, if the stocks are not perfectly correlated with each other. The correlation coefficient, as the reader remembers, is the covariance of two series, divided by the product of the respective standard deviations. The correlation coefficient allows an investor to understand the statistical nature of a covariance because the correlation coefficient is bounded between -1 and +1. Low correlations coefficients imply that the assets are not good substitutes for one another, and diversification is enhanced by using assets with lower correlations. The covariance between two series is calculated as the sum of the product of the differences between each series and its respective mean. If the covariance of DuPont and IBM is positive, then this implies that when DuPont's return is above its mean or expected value, then IBM's return is above its mean. The correlation coefficient of the two series is 0.531, which implies that the investor might not want to have only DuPont and IBM in a two asset portfolio. The correlation coefficient of DuPont and Dominion Resources is only -.397, which is the lowest set of correlations in the three assets, and an investor would want to use DuPont and Dominion Resources to build a two asset portfolio, if the investor wants to minimize risk. The most important question is what portfolio weights will minimize risk?

Table 1. Annual Dividends and Prices, 1994-2003

	D				DD				IBM			
Year	Phigh	Plow	Div	AvgP	Phigh	Plow	Div	AvgP	Phigh	Plow	Div	AvgP
2003	65.95	51.74	2.58	58.85	46.00	38.00	1.40	42.00	91.54	73.17	0.63	82.355
2002	67.05	35.40	2.58	51.23	49.80	35.02	1.40	42.41	126.39	54.01	0.59	90.200
2001	69.99	55.13	2.58	62.56	49.88	32.64	1.40	41.26	124.70	83.75	0.55	104.225
2000	67.93	34.81	2.58	51.37	74.00	38.18	1.40	56.09	134.93	80.06	0.51	107.495
1999	49.37	36.56	2.58	42.97	75.18	50.06	1.40	62.62	139.18	80.87	0.47	110.025
1998	48.93	37.81	2.58	43.37	84.43	51.68	1.36	68.06	94.96	47.81	0.44	71.385
1997	42.87	33.25	2.58	38.06	69.75	46.37	1.23	58.06	56.75	31.78	0.39	44.265
1996	44.37	36.87	2.58	40.62	49.68	34.81	1.11	42.25	41.50	20.78	0.33	31.140
1995	41.62	34.87	2.58	38.25	36.50	26.31	1.02	31.41	28.65	17.56	0.25	23.105
1994	45.37	34.87	2.55	40.12	31.18	24.12	0.91	27.65	19.09	12.84	0.25	15.965

Source: Standard and Poor's, *Stock Price Guide.*

Table 2. Holding Period Returns, 1995-2003 of DD, D, and IBM

	D	DD	IBM
Year	HPR	HPR	HPR
2003	0.1991	0.0233	-0.0800
2002	-0.1399	0.0618	-0.1289
2001	0.2681	-0.2394	-0.0253
2000	0.2557	-0.0819	-0.0184
1999	0.0501	-0.0593	0.5479
1998	0.2073	0.1956	0.6226
1997	0.0005	0.4035	0.4340
1996	0.1296	0.3805	0.3620
1995	0.0176	0.1727	0.4629

Table 3. Correlation Matrix of HPRs

	D	DD	IBM
D	1.0000	-0.3965	-0.1110
DD	-0.3965	1.0000	0.5314
IBM	-0.1110	0.5314	1.0000

The portfolio variance is given by the weighted asset variances and covariances.

$$\sigma_p^2 = x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + 2x_1(1-x_1)\sigma_{12} \tag{1}$$

$$\sigma_{12} = \rho_{12}\sigma_1\sigma_2$$

p_{12} = correlation coefficients of assets 1, 2

σ_{12} = covariance of assets 1, 2

2. MINIMIZING RISK

To minimize risk, one seeks to allocate resources to assets such that the change in risk goes to zero with the change in the percentage invested in the asset. That is, risk minimization implies a first partial derivative of zero, with respect to the change in the asset weight.

Let $x_2 = 1\text{-}x_1$

$$\sigma_p^2 = x_1^2\sigma_1^2 + (1-x_1)^2\sigma_2^2 + 2x_1(1-x_1)\sigma_{12}$$

$$= x_1^2\sigma_1^2 + (1-x_1)^2\sigma_2^2 + 2x_1(1-x_1)\rho_{12}\sigma_1\sigma_2$$

$$= x_1^2\sigma_1^2 + (1-x_1)(1-x_1)\sigma_2^2 + 2x_1\rho_{12}\sigma_1\sigma_2 - 2x_1^2\rho_{12}\sigma_1\sigma_2$$

$$\sigma_p^2 = x_1^2\sigma_1^2 + (1-2x_1+x_1^2)\sigma_2^2 + 2x_1\rho_{12}\sigma_1\sigma_2 - 2x_1^2\rho_{12}\sigma_1\sigma_2$$

$$\frac{\partial\sigma\rho^2}{\partial x_1} = 2x_1\sigma_1^2 - 2\sigma_2^2 + 2x_1\sigma_2^2 + 2\rho_{12}\sigma_1\sigma_2 - 4x_1\rho_{12}\sigma_1\sigma_2 = 0$$

$$2\sigma_2^2 - 2\rho_{12}\sigma_1\sigma_2 = 2x_1\sigma_1^2 + 2x_1\sigma_2^2 - 4x_1\rho_{12}\sigma_1\sigma_2$$

$$(\sigma_1^2 + \sigma_2^2 - 2\rho_{12}\sigma_1\sigma_2)x_1 = \sigma_2^2 - \rho_{12}\sigma_1\sigma_2$$

$$x_1 = \frac{\sigma_2(\sigma_2 - p_{12}\sigma_2)}{\sigma_1^2 + \sigma_2^2 - 2\rho_{12}\sigma_1\sigma_2} \tag{2}$$

Equation (2) shows the risk-minimizing weight (percentage invested) of asset one in the portfolio.

In an equally-weighted portfolio, $x_1 = x_2 = .50$. Let x_1 = wt. of DD and x_2 = wt. of D. The portfolio expected return is a weighted combination of asset expected returns.

$$E(R_\rho) = x_1E(R_1) + x_2E(R_2) \quad (3)$$
$$= .5(.095) + .5(.110) = .103$$

$$\sigma_\rho^2 = (.5)^2(.0407) + (.5)^2(.0167) + 2(.5)(.5)(.137)(.214)(-.397)$$
$$= .0042 + .0102 + (-.0058)$$
$$= .0086$$
$$\sigma\rho = \sqrt{.0086} = .0926$$

The expected return on an equally-weighted portfolio of DD and D stock is 10.30 percent, and its corresponding standard deviation is 9.26 percent. The portfolio return should fall within the range of 1.04 percent and 19.56 percent approximately 67.6 percent of the time. This range corresponds to the expected return plus and minus one standard deviation of return.

If one created an optimally-weighted portfolio of DD and D using equation (2), one can solve for the optimal weights.

$$x_1 = x_{DD} = \frac{\sigma_2(\sigma_2 - \sigma_1\rho_{12})}{\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}}$$
$$= \frac{.137(.137 - .214(-.397))}{(.214)^2 + (.137)^2 - 2(.214)(.137)(-.397)}$$
$$x_{DD} = \frac{.0188 + .0116}{.0458 + .0188 + .0233} = \frac{.0304}{.0879} =$$
$$x_{DD} = .346$$
$$x_D = .654$$

An investor should invest 34.6 percent of his or her assets in DuPont and

$$E(R\rho) = .654(.110) + .346\,(.095) = .072 + .033 = .105$$
$$\sigma_\rho^2 = (.346)^2\,(.0407) + (.654)^2(.0167) + 2(.654)(.346)(-.397)(.137)(.214)$$
$$= .0049 + .0071 + (-.0053)$$
$$\sigma_\rho^2 = .0067$$
$$\sigma_\rho = .0819$$

The optimally weighted portfolio return is 10.50 percent, and its standard deviation is only 8.20 percent. The portfolio variance is reduced by using negatively correlated securities.

3. THE THREE ASSET CASE

Let us now examine a three asset portfolio construction process using DuPont, Dominion Resources, and IBM securities.

$$E(R_\rho) = \sum_{i=1}^{N} x_i\, E(R_i) \tag{4}$$

$$\sigma_\rho^2 = \sum_{i=1}^{N} \sum_{j=1}^{N} x_i x_j \sigma_{ij} \tag{5}$$

$$E(R_\rho) = x_1\, E(R_1) + x_2\, E(R_2) + x_3\, E(R_3)$$

$$\text{let } x_3 = 1 - x_1 - x_2$$

$$E(R_\rho) = x_1\, E(R_1) + x_2\, E(R_2) + (1 - x_1 - x_2)\, E(R_3)$$

$$\begin{aligned}
\sigma_p^2 &= x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + \sigma_3^2 x_3^2 + 2x_1x_2\sigma_{12} + 2x_1x_3\sigma_{23} + 2x_2x_3\sigma_{23} \\
&= x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + (1 - x_1 - x_2)^2\sigma_3^2 + 2x_1x_2\,\sigma_{12} + 2x_1\,(1 - x_1 - x_2)\,\sigma_{13} \\
&\quad + 2x_2(1 - x_1 - x_2)\,\sigma_{23} \\
&= x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + (1 - x_1 - x_2)(1 - x_1 - x_2)\sigma_3^2 + 2x_1x_2\,\sigma_{12} + 2x_1\sigma_{13} \\
&\quad - 2x_1^2\sigma_{13} - 2x_1x_2\sigma_{13} + 2x_2\sigma_{23} - 2x_1x_2\sigma_{23} - 2x_2^2\sigma_{23} \qquad (6) \\
&= x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + (1 - 2x_1 - 2x_2 + 2x_1x_2 + x_1^2 + x_2^2)\sigma_3^2 + 2x_1x_2\,\sigma_{12} \\
&\quad + 2x_1\sigma_{13} - 2x_1^2\sigma_{13} - 2x_1x_2\sigma_{13} + 2x_2\sigma_{23} - 2x_1x_2\sigma_{23} - 2x_2^2\sigma_{23}
\end{aligned}$$

$$\frac{\partial\sigma_\rho^2}{\partial x_1} = 2x_1(\sigma_1^2 + \sigma_3^2 - 2\sigma_{13}) + x_2\,(2\sigma_3^2 + 2\sigma_{12} - 2\sigma_{13} - 2\sigma_{23}) - 2\sigma_3^2 +$$

$$2\sigma_{13} = 0$$

$$\frac{\partial\sigma_\rho^2}{\partial x_2} = 2x_2(\sigma_2^2 + \sigma_3^2 - 2\sigma_{23}) + x_1\,(2\sigma_3^2 + 2\sigma_{12} - 2\sigma_{13} - 2\sigma_{23}) - 2\sigma_3^2 +$$

$$2\sigma_{23} = 0$$

Let's assume

Asset	Security
1	D
2	DD
3	IBM

$$\frac{\partial \sigma_\rho^2}{\partial x_1} = 2x_1\ [(.0167) + (.0799) - 2(-.0041)]$$
$+ x_2\ [2(.0799) + 2(-.0103)-2(-.0041)$
$- 2\ (.0303)] - 2(.0799) + 2(-.0013)$
$- 2\ (.096)^2 + 2\ (.651)(.172)(.096)$
$= 2x_1\ [.0884) + x_2\ (.1598 - .0206 + .0082$
$- .0606) - .1598 - .0026 = 0$
$= .1768x_1 + .0868x_2 - .1624 = 0$
$-.1768x_1 = .0868x_2 - .1624$
$x_1 = - .4910x_2 + .9186$

$$\frac{\partial \sigma_\rho^2}{\partial x_2} = 2x_2\ [.0407 + .0799 - 2(.0303)]$$
$+ x_1\ [2(.0799) + 2(-.0103)$
$- 2(-.0041) - 2(.0303)] - 2\ (.0799)$
$+ 2\ (.0303)$
$= 2x_2\ (.0600) + .0868x_1 - .1598 + .0606$
$= .1200x_2 + .0868x_1 - .0992 = 0$
$- .1200x_2 = .0868x_1 - .0992$
$x_2 = - .7233x_1 + .8267$

We now have two equations and two unknowns, x_1 and x_2. To solve for optimal weights, we put the x_2 representation into the x_1 equation and solve

$x_1 = -.4910x_2 + .9186$
$x_1 = -.491(-.7233x_1 + .8267) + .9186$
$x_1 = .3551x_1 -.4059 + .9186$
$.6449x_1 = .5127$
$x_1 = .7950$

$x_2 = -.7233\ (.7950) + .8267$
$= -.5750 + .8267$
$x_2 = .2517$

$x_3 = 1 - x_1 - x_2 = 1 - .7950 - .2517$
$= -.0467$

The optimal portfolio weights involve selling IBM short and going long on DuPont and Dominion. How does the portfolio using optimal weights compare to an equally weighted portfolio of the three assets?

The equally weighted portfolio has an expected return of 14.9 percent and a 13.42 percent standard deviation.

$$E(R_\rho) = .333\,(.110 + .095 + .242) = .149$$

$$\sigma_\rho^2 = (.333)^2\,(.0167)^2 + (.333)^2\,(.0407) + (.333)^2(.0799) + 2(.333)(.333)(-.0103) + 2\,(.333)(.333)(-.0041) + 2(.333)(.333)(.0303)$$

$$\sigma_\rho^2 = .0019 + .0045 + .0081 + (-.0023) + (-.0009) + .0067 = .0180$$

$$\sigma_\rho = .1342$$

The optimally weighted portfolio has an expected return of

$$E(R_\rho) = .795(.110) + .2517\,(.095) + (-.0467)(.242) = .0875 + .0244 + (-.0113) = .1006$$

$$\sigma_\rho^2 = (.795)^2\,(.0167) + (.2517)^2\,(.0407) + (-.0467)^2\,(.0799) + 2\,(.795)(.2517)(-.0103) + 2(.795)(-.0467)(-.0041) + 2(.2517)(-.0467)(.0303)$$
$$= .0106 + .0026 + .0002 + (-.0041) + .0003 + (-.0007)$$

$$\sigma_\rho^2 = .0089$$

$$\sigma_\rho = .0943$$

The optimally weighted portfolio has an expected return of 10.06 percent and a standard deviation of 9.43 percent. Portfolio risk can be significantly reduced through diversification.

Markowitz analysis sought to minimize risk for a given level of return. Thus, one could construct an infinite number of portfolios, by varying security weights, but the Efficient Frontier contained securities with weights that maximized return for a given level of risk.

The Capital Market Line (CML), was developed to describe the return-risk trade-off assuming that investors could borrow and lend at the risk-free rate, RF, and that investors must be compensated for bearing risk. Investors seek to hold mean-variance efficient portfolios, invest for a one-period horizon, pay no taxes or transactions costs (we wish), and have homogeneous beliefs.[2] That is, all investors have identical probabilities of the distribution of future returns of securities.

$$E(\widetilde{R}\rho) = R_F + \left[\frac{E(\widetilde{R}_M) - R_F}{\sigma_M}\right]\sigma_\rho \tag{7}$$

$E(R_\rho)$ = Expected return on the portfolio;
$E(R_M)$ = Expected return on the market portfolio, where all securities are held relative to their market value;
σ_M = Standard deviation of the market portfolio;
and σ_ρ = standard deviation of the portfolio.

The reader notes that as the standard deviation of the portfolio rises, its expected return must rise.

4. AN INTRODUCTION TO MODERN PORTFOLIO THEORY

Markowitz created a portfolio construction theory in which nvestors should be compensated with higher returns for bearing higher risk. The Markowitz framework measured risk as the portfolio standard deviation, its measure of dispersion, or total risk. The Sharpe (1964), Lintner (1965), and Mossin (1966) development of the Capital Asset Pricing Model (CAPM) held that investors are compensated for bearing not total risk, but rather market risk, or systematic risk, as measured by the stock beta. An investor is not compensated for bearing risk that may be diversified away from the portfolio. The beta is the slope of the market model, in which the stock return is regressed as a function of the market return.

The CAPM holds that the return to a security is a function of the security beta.

$$R_{jt} = R_F + \beta_j\,[E(R_{Mt}) - R_F] + e_j \tag{8}$$

where
R_{jt} = expected security return at time t;
$E\,(R_{Mt})$ = expected return on the market at time t;
R_F = risk-free rate;
β_j = security beta; and
e_j = randomly distributed error term.

Let us examine the Capital Asset Pricing Model beta, its measure of systematic risk, from the Capital Market Line equilibrium condition.

$$\beta_j = \frac{Cov(R_j, R_M)}{Var(R_M)} \tag{9}$$

$$E(R_j) = R_F + \left[\frac{E(R_M) - R_F}{\sigma_M{}^2}\right] Cov\ (R_j, R_M)$$

$$= R_F + [E(R_M) - R_F]\ \frac{Cov(R_j, R_M)}{Var(R_M)}$$

$$E(R_j) = R_F + [E(R_M) - R_F]\ \beta_j \tag{10}$$

The Security Market Line, SML, shown in Equation (10), is the linear relationship between return and systematic risk, as measured by beta.[3]

Let us estimate beta coefficients to be used in the Capital Asset Pricing Model (CAPM), to determine the rate of return on equity. One can regress monthly HPRs against a value-weighted Center for Research in Security Prices (CRSP) index, an index of all publicly traded securities. Most security betas are estimated using five years of monthly data, some sixty observations, although one can use almost any number of observations. One generally needs thirty observations for normality of residuals to occur. One can use the Standard & Poor's 500 Index, or the Dow Jones Industrial Index (DJIA), or many other stock indexes. The IBM beta is 1.32 when estimated using the value-weighted CRSP index.

Table 5. Estimated IBM Beta

The REG Procedure
Model: MODEL1
Dependent Variable: ret

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.27670	0.27670	35.96	<.0001
Error	58	0.44630	0.00769		
Corrected Total	59	0.72301			

Root MSE	0.08772	R-Square	0.3827
Dependent Mean	0.00636	Adj R-Sq	0.3721
Coeff Var	1379.25312		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.00374	0.01133	0.33	0.7425
vwretd	1	1.32057	0.22022	6.00	<.0001

The reader sees that the IBM beta has a t-value of 6.00, which is highly statistically significant. One must be careful, because the t-value allows one to reject a null hypothesis that the beta is zero. If the reader wants to calculate a t-value to test the hypothesis that the beta is equal to one, a more plausible assumption, then a second t-value estimated must be calculated. One must divide the beta coefficient, less its hypothesized value, by the estimated standard error of the coefficient.

$$\text{t-value} = \frac{1.32 - 1.00}{.220} = 1.45$$

The calculated t-value of IBM of 1.45 does not allow the reader to reject the null hypothesis that the IBM beta is 1.00 at the 10 percent level (the critical t-value is, of course, 1.645).

The stock betas reported in the S&P *Stock Guide* use five years of monthly returns and the Standard & Poor's 500 Index as their benchmark. If one regresses five years, January 1998-December 2003, of monthly returns for IBM as a function of the S&P 500 Index returns, one obtains a beta of 1.449, and a t-value of 6.47. The IBM beta is statistically significant from zero and one, having a t-value of 2.00 using a hypothesized value of 1.0

$$t = \frac{1.449 - 1.000}{.224} = 2.00$$

The estimated beta is in agreement with the reported beta in the IBM *Stock Guide*.

IBM is an aggressive security, having a beta exceeding unity. A defensive security has a beta less than one. If the (S&P 500) market is expected to rise 10 percent in the coming year, we should expect IBM stock to rise about 13.6 percent.

The corresponding betas for DuPont and Dominion Resources are:

Security	Value-Wt. CRSP	S&P 500
DD	0.803	0.903
(t)	(4.55)	(5.24)
D	0.143	0.244
	(0.79)	(1.30)

If an investor estimates that the security's expected return exceeds the required rate of return from the CAPM and its beta, then the security should be purchased. The incremental purchase of the security drives up its price, and lowers its expected return.

The difficulty of measuring beta and its corresponding Security Market Line gave rise to extra-market measures of risk, found in the work of King (1966), Farrell (1973), Rosenberg (1973, 1976, 1979), Stone (1974, 2002), Ross (1976) and Ross and Roll (1980). The BARRA risk model was developed in the series of studies by Rosenberg and completely discussed in Grinhold and Kahn (1999), that is discussed in the next chapter.

The total excess return for a multiple factor model, referred to as the MFM, in the Rosenberg methodology for security j, at time t, dropping the subscript t for time, may be written:

$$E(R_j) = \sum_{k=1}^{K} \beta_{jk} \tilde{f}_k + \tilde{e}_j \qquad (11)$$

The non-factor, or asset-specific, return on security j, is the residual risk of the security, after removing the estimated impacts of the K factors. The term, f , is the rate of return on factor k. A single factor model, in which the market return is the only estimated factor, is obviously the basis of the Capital Asset Pricing Model. We discuss multifactor risk models in the next chapter.

5. EXPECTED RETURNS VS HISTORIC MEAN RETURNS

The expected returns on assets are not completely explained by using only historic means of the securities. One may estimate models of expected return using expectation data and reported financial data. There are several approaches to security valuation and the creation of expected returns. Graham and Dodd (1934) recommended that stocks be purchased on the basis of the price-earnings ratio. Graham and Dodd suggested that no stock should be purchased if its price-earnings ratio exceeded 1.5 times the price-earnings multiple of the market. Thus the “low price-earnings” (PE) criteria was established. It is interesting that Graham and Dodd put forth the low PE model at the height of the Great Depression. Basu (1977) reported evidence supporting the low PE model. Academicians often prefer to test the low P/E approach by testing its reciprocal, the “high EP” approach. The high EP approach specifically addresses the issue of negative earnings per share, which can confuse the low P/E test. Hawawini and Kreim (1995) found statistical support for the high EP variable of NYSE and AMEX stocks from

April 1962 - December 1989. At a minimum, Graham and Dodd advocated the calculation of a security's net current asset value, NCAV, defined as its current assets less all liabilities. A security should be purchased if its net current value exceeded its current stock price. The price-to-book (PB) ratio should be calculated, but not used as a measure for stock selection, according to Graham and Dodd (1962).

6. FUNDAMENTAL ANALYSIS AND STOCK SELECTION

Fundamental variables such as cash flow and sales have put used in composite valuation models for security selection [Ziemba (1990, 1992) and Guerard (1992, 1993)]. Livnat (1994) advocated the calculation of free cash flow, which subtracts capital expenditures from the operating cash flow. In addition to the income statement indicators of value, such as earnings, cash flow, and sales, many value-focused analysts also consider balance sheet variables, especially the book-to-market ratio. The income statement measures are dividends, earnings, cash flow, and sales and the key balance sheet measure is common equity per share outstanding, or book value. Expected returns modeling has been analyzed with a regression model in which security returns are functions of fundamental stock data, such as earnings, book value, cash flow, and sales, relative to stock prices, and forecast earnings per share [Fama and French (1992, 1995), Bloch, Guerard, Markowitz, Todd, and Xu (1993), Guerard, Takano, and Yamane (1993), Ziemba (1992), Guerard (1997), and Stone, Guerard, and Gultekin (1997, 2002)]. Hawawini and Keim (1995) found statistical support for the high cash flow-to-price (CP) and low price-to-book (P/B) variables of NYSE and AMEX stocks from April 1962- December 1989.

Fama and French (1995) argue that the contrarian investment strategy is inconsistent with market data. Fama and French report results of a three-factor model that incorporates the market factor, size factor, and book-to-market ratio. In the Fama and French analysis of the CRSP database for the 1963-1994 period, the value-weighted market return exceeded the risk-free rate by approximately 5.2 percent, annually, whereas smaller stocks outperformed larger stocks by 3.2 percent annually, and higher book-to-market (price) outperformed smaller book-to-market stocks by 5.4 percent, annually. The Fama and French model may be written as:

$$R_j - R_F = \beta_M R_M + \beta_{size} R_{size} + \beta_{BM} R_{BM} \tag{12}$$

where

R_j = Stock return;
β_M = Market beta;
R_M = Return on Market index less the risk-free rate;
β_{size} = Size beta;
R_{size} = Return on size variable, defined as the return on small stocks less the return on large stocks;
β_{BM} = Book-to-Market beta;

and R_{BM} = Returns on high book-to-market stocks less the returns on low book-to-market stocks.

The authors report the Fama and French three-factor model because of its importance in the literature. The results of the stock selection model introduced and estimated in the following section does not place a higher weight on the book-to-market (price) ratio than on the cash flow, relative book-to-price (and relative earnings, cash flow, and sales-to-price ratios), and analysts' forecast variables.

In 1975, a database of earnings per share (eps) forecasts was created by Lynch, Jones, and Ryan, a New York brokerage firm, by collecting and publishing the consensus statistics of one-year-ahead and two-year-ahead eps forecasts [Brown (1999)]. The database has evolved to be known as the Institutional Brokerage Estimation Service (I/B/E/S) database. There is an extensive literature regarding the effectiveness of analysts' earnings forecasts, earnings revisions, earnings forecast variability, and breadth of earnings forecast revisions, summarized in Bruce and Epstein (1994) and Brown (1999). The vast majority of the earnings forecasting literature in the Bruce and Brown references find that the use earnings forecasts do not increase stockholder wealth, as specifically tested in Elton, Gruber, and Gultekin (1981). Reported earnings follow a random walk with drift process, and analysts are rarely more accurate than a no-change model in forecasting earnings per share [Cragg and Malkiel (1968), Guerard and Stone (1992)]. Analysts become more accurate as time passes during the year, and quarterly data is reported. Analyst revisions are statistically correlated with stockholder returns during the year [Hawkins, Chamberlain, and Daniel (1984) and Arnott (1985). Wheeler (1994) developed and tested a strategy in which analyst forecast revision breadth, defined as the number of upward forecast revisions less the number of downward forecast revisions, divided by the total number of estimates, was the criteria for stock selection. Wheeler found statistically significant excess returns from the breadth strategy. A composite earnings variable, CTEF, is calculated using equally-weighted revisions, forecasts, and breadth of FY1 and FY2 forecasts, a variable put forth in Guerard (1997).

Guerard (1992, 1993), Ziemba (1990, 1992), and Guerard, Gultekin and Stone (1997) employed annual fundamental Compustat variables, such as earnings, book value, cash flow, and sales, in addition to the composite earnings forecasting model in a regression model to identify the determinants of quarterly equity returns. The regression models used in the Guerard et al. (1997). studies employed the Beaton-Tukey robust regression procedure and latent root regression techniques to address the issues of outliers and multicollinearity. The reader was introduced to the robust regression and multicollinearity techniques in Chapter 12. Ziemba used capitalization-weighted regressions. Both sets of studies found statistical significance with expectation and reported fundamental data.

7. MODERN PORTFOLIO THEORY AND GPRD: AN EXAMPLE OF MARKOWITZ ANALYSIS

In 1990, Harry Markowitz became the Head of the Global Portfolio Research Department (GPRD) at Daiwa Securities Trust. His department used fundamental data to create models for Japanese and U.S. securities. The basic models tested included the earnings-to-price strategy (EPR), which is the inverse of the low P/E strategy, the book value-to-price (BPR), the cash flow-to-price (CPR), and sales-to-price (SPR) ratios. These variables should be positively associated (correlated) with subsequent returns. Single variable and composite model strategies were tested in the Japan and the US, 1974-1990. The composite models could be created by combining the variables using ordinary least squares (OLS), outlier-adjusted or robust regression (ROB), or weighted latent root regression (WLRR) modeling techniques, in which outliers and the high correlations among the variables are used in the estimation procedures. The reader is referred to Chapter 12 for a discussion of ROB and WLRR techniques. The Markowitz group tested single variables and composite model strategies, using the outlier-adjustment and multicollinearity modeling techniques shown in Chapter 12. The Proprietary models combined the outlier adjustments and multlicollinearity techniques to substantially outperform the Japanese equity market, 1990-1994. The Markowitz group found that the use of the more advanced statistical techniques produced higher relative out-of-sample portfolio geometric returns and Sharpe ratios. Statistic modeling is not just fun, but it is consistent with maximizing portfolio returns. The quarterly estimated models outperformed the semi-annual estimated models, although the underlying data was semi-annual in Japan. The dependent variable in the composite model is total security returns and the independent variables are the EPR, BPR, CPR, and SPR variables. Earnings forecasts published by Toyo Keizai were later introduced to the GPRD model, and the model produced significant out-performance on a real-time basis [see Guerard, Takano, and Yamane (1993), p. 98].

Exhibit 1. Portfolio Simulations of D-POS

D-POS, Japan. Simulation results: sorted by geometric mean. Let UL = 2.0 TCR = 2.0 PM = −1 PPar = 0.90 Begin = 7412 End = 9012.

SID	OP	TOV	RP	Rtri	ERET	GM	Shrp
900869	3	10.00	1	25.0	PROPRIETARY	25.60	0.89
900867	3	10.00	0	0.0	PROPRIETARY	25.39	0.89
900868	3	10.00	1	20.0	PROPRIETARY	25.32	0.87
900860	3	15.00	1	25.0	PROPRIETARY	24.28	0.84
900853	3	15.00	0	0.0	PROPRIETARY	24.19	0.85
900858	3	10.00	1	25.0	PROPRIETARY	24.04	0.85
900852	3	12.50	0	0.0	PROPRIETARY	23.94	0.85
900855	3	10.00	1	20.0	PROPRIETARY	23.93	0.86
900856	3	12.50	1	20.0	PROPRIETARY	23.90	0.84
900854	3	17.50	0	0.0	PROPRIETARY	23.89	0.84
900859	3	12.50	1	25.0	PROPRIETARY	23.89	0.83
900857	3	15.00	1	20.0	PROPRIETARY	23.81	0.82
900819	3	10.00	0	0.0	REGR(WLRR,4Q,4)	22.74	0.83
900820	3	10.00	1	25.0	REGR(WLRR,4Q,4)	22.68	0.82
900944	3	10.00	0	0.0	BPR	22.43	0.78
900908	3	10.00	1	20.0	REGR(LRR,4Q,9.l)	22.23	0.75
900874	3	10.00	0	0.0	REGR(OLS,4Q,8)	22.16	0.79
900878	3	10.00	0	0.0	REGR(OLS,4Q,9.1)	22.16	0.79
900903	3	10.00	0	0.0	REGR(OLS,4Q,8)	22.16	0.79
900914	3	10.00	0	0.0	REGR(OLS,4Q,9.1)	22.16	0.79
900841	3	10.00	1	25.0	REGR(WLRR,1Q,4)	22.00	0.79
900817	3	10.00	0	0.0	REGR(LRR,4Q14)	21.99	0.76
900983	3	10.00	1	20.0	REGR(WLRR,4Q,9.1)	21.93	0.75
900984	3	10.00	1	20.0	REGR(WLRR,4Q,9.l)	21.86	0.75
900794	3	15.00	1	20.0	REGR(WLRR,1Q,4)	21.84	0.76
900818	3	10.00	1	25.0	REGR(LRR,4Q,4)	21.84	0.75
900877	3	10.00	0	0.0	REGR(WLRR,4Q,8)	21.84	0.78
900906	3	10.00	0	0.0	REGR(WLRR,4Q,8)	21.84	0.78
900985	3	12.50	1	20.0	REGR(WLRR,4Q,9.1)	21.84	0.75
900913	3	10.00	0	0.0	REGR(WLRR,4Q,9.2)	21.83	0.77
900793	3	12.50	1	20.0	REGR(WLRR,1Q,4)	21.78	0.78
900791	3	12.50	0	0.0	REGR(WLRR,1Q,4)	21.75	0.79
900792	3	15.00	0	0.0	REGR(WLRR,1Q,4)	21.68	0.77
900982	3	10.00	1	20.0	REGR(WLRR,4Q,9.1)	21.66	0.75
900842	3	10.00	1	25.0	REGR(WLRR,10,4)	21.55	0.79
900766	3	10.00	1	20.0	REGR(WLRR,1Q,4)	21.49	0.78
900810	3	15.00	0	0.0	REGR(WLRR,1Q,4)	21.47	0.76
900901	3	10.00	0	0.0	REGR(LRR,4Q,9.1)	21.45	0.72
900813	3	10.00	0	0.0	REGR(OLS,4Q,4)	21.42	0.78
900840	3	10.00	1	25.0	REGR(WLRR,1Q,4)	21.41	0.76
900838	3	10.00	1	25.0	REGR(WLRR,1Q,4)	21.40	0.76
900909	3	10.00	1	20.0	REGR(WLRR,4Q,9.1)	21.40	0.75
900910	3	10.00	0	0.0	REGR(LRR,4Q,9.2)	21.34	0.75
900816	3	10.00	1	25.0	REGR(ROB,4Q,4)	21.30	0.76
900839	3	10.00	1	25.0	REGR(WLRR,1Q,4)	21.30	0.75

SID	OP	TOV	RP	Rtri	ERET	GM	Shrp
900912	3	10.00	0	0.0	REGR(LRR,4Q,9.2)	21.29	0.71
900765	3	10.00	0	0.0	REGR(WLRR,1Q,4)	21.24	0.76
900815	3	10.00	0	0.0	REGR(ROB,4Q,4)	21.23	0.76
900902	3	10.00	0	0.0	REGR(WLRR,4Q,9.1)	21.16	0.74
900986	3	15.00	1	20.0	REGR(WLRR,4Q,9.1)	21.09	0.72
900954	3	10.00	0	0.0	REGR(OLS,4Q,4)	20.91	0.72
900876	3	10.00	0	0.0	REGR(LRR,4Q,8)	20.90	0.74
900905	3	10.00	0	0.0	REGR(LRR,4Q,8)	20.90	0.74
900911	3	10.00	0	0.0	REGR(ROB,4Q,9.2)	20.66	0.72
900907	3	10.00	1	20.0	REGR(ROB,4Q,9.1)	20.36	0.74
900763	3	10.00	0	0.0	REGR(LRR,1Q,4)	20.21	0.71
900875	3	10.00	0	0.0	REGR(ROB,4Q,8)	20.15	0.71
900904	3	10.00	0	0.0	REGR(ROB,4Q,8)	20.15	0.71
900787	3	12.50	0	0.0	REGR(LRR,1Q,4)	20.08	0.71
900900	3	10.00	0	0.0	REGR(ROB,4Q,9.1)	20.07	0.72
900781	3	12.50	1	20.0	REGR(OLS,1Q,4)	19.96	0.71
900788	3	15.00	0	0.0	REGR(LRR,1Q,4)	19.92	0.70
900764	3	10.00	1	20.0	REGR(LRR,1Q,4)	19.88	0.70
900790	3	15.00	1	20.0	REGR(LRR,1Q,4)	19.81	0.70
900789	3	12.50	1	20.0	REGR(LRR,1Q,4)	19.78	0.70
900779	3	12.50	0	0.0	REGR(OLS,1Q,4)	19.77	0.67
900786	3	15.00	1	20.0	REGR(ROB,1Q,4)	19.76	0.71
900780	3	15.00	0	0.0	REGR(OLS,1Q,4)	19.72	0.69
900784	3	15.00	0	0.0	REGR(ROB,1Q,4)	19.67	0.71
900782	3	15.00	1	20.0	REGR(OLS,1Q,4)	19.41	0.69
900759	3	10.00	0	0.0	REGR(OLS,1Q,4)	19.40	0.67
900785	3	12.50	1	20.0	REGR(ROB,1Q,4)	19.33	0.69
900760	3	10.00	1	20.0	REGR(OLS,1Q,4)	19.31	0.66
900783	3	12.50	0	0.0	REGR(ROB,1Q,4)	19.10	0.69
900761	3	10.00	0	0.0	REGR(ROB,1Q,4)	19.03	0.68
900931	3	10.00	0	0.0	CPR	19.01	0.68
900762	3	10.00	1	20.0	REGR(ROB,1Q,4)	19.00	0.67
900932	3	10.00	0	0.0	SPR	18.63	0.61
900716	3	10.00	1	20.0	benchmark	17.25	0.60
900927	3	10.00	0	0.0	EPR	16.82	0.57
900826	6	20.00	3	25.0	PROPRIETARY	24.63	0.84
900709	6	20.00	3	20.0	PROPRIETARY	23.61	0.81
900710	6	20.00	3	25.0	PROPRIETARY	23.44	0.82
900733	6	25.00	1	20.0	PROPRIETARY	23.34	0.80
900773	6	17.50	3	20.0	PROPRIETARY	23.26	0.78
900707	6	20.00	3	20.0	PROPRIETARY	23.08	0.79
900847	6	20.00	0	0.0	PROPRIETARY	22.62	0.81
901030	6	20.00	3	20.0	BPR	22.42	0.78
900796	6	20.00	3	20.0	REGR(OLS,2S,4)	22.33	0.79
901047	6	20.00	3	20.0	BPR	22.20	0.77
900770	6	22.50	0	0.0	REGR(OLS,1S,4)	22.17	0.77
900795	6	20.00	0	0.0	REGR(OLS,2S,4)	22.14	0.79
900749	6	20.00	3	25.0	REGR(OLS,1S,4)	22.03	0.78
900800	6	20.00	3	20.0	REGR(LRR,2S,4)	21.98	0.78
900849	6	20.00	0	0.0	REGR(LRR,3S,4)	21.98	0.77

SID	OP	TOV	RP	Rtri	ERET	GM	Shrp
900748	6	20.00	3	20.0	REGR(OLS,1S,4)	21.80	0.77
900754	6	20.00	3	20.0	REGR(LRR,12,4)	21.68	0.74
900747	6	20.00	0	0.0	REGR(OLS,1S,4)	21.65	0.77
900802	6	20.00	3	20.0	REGR(WLRR,2S,4)	21.60	0.79
901029	6	20.00	0	0.0	BPR	21.59	0.76
900755	6	20.00	3	25.0	REGR(LRR,1S,4)	21.52	0.74
900799	6	20.00	0	0.0	REGR(LRR,2S,4)	21.51	0.77
901046	6	20.00	0	0.0	BPR	21.49	0.76
900801	6	20.00	0	0.0	REGR(WLRR,2S,4)	21.40	0.79
900769	6	17.50	0	0.0	REGR(OLS,1S,4)	21.34	0.76
900778	6	22.50	3	20.0	REGR(WLRR,1S,4)	21.30	0.79
900772	6	22.50	0	0.0	REGR(LRR,1S,4)	21.26	0.72
900753	6	20.00	0	0.0	REGR(LRR,1S,4)	21.20	0.72
900756	6	20.00	0	0.0	REGR(WLRR,1S,4)	21.10	0.77
900757	6	20.00	3	20.0	REGR(WLRR,1S,4)	21.06	0.78
900758	6	20.00	3	25.0	REGR(WLRR,1S,4)	21.02	0.78
900777	6	17.50	3	20.0	REGR(WLRR,1S,4)	20.95	0.78
900771	6	17.50	0	0.0	REGR(LRR,1S,4)	20.93	0.71
900848	6	20.00	0	0.0	REGR(ROB,3S,4)	20.74	0.76
900776	6	22.50	3	20.0	REGR(ROB,1S,4)	20.37	0.76
900797	6	20.00	0	0.0	REGR(ROB,22,4)	20.24	0.75
900798	6	20.00	3	20.0	REGR(ROB,2S,4)	20.12	0.76
900752	6	20.00	3	25.0	REGR(ROB,1S,4)	19.56	0.73
900751	6	20.00	3	20.0	REGR(ROB,1S,4)	19.35	0.73
900750	6	20.00	0	0.0	REGR(ROB,1S,4)	19.29	0.72
900775	6	17.50	3	20.0	REGR(ROB,1S,4)	19.26	0.72
901049	6	20.00	3	20.0	CPR	18.99	0.68
901051	6	20.00	3	20.0	SPR	18.69	0.61
901048	6	20.00	0	0.0	CPR	18.65	0.67
901050	6	20.00	0	0.0	SPR	17.87	0.59
901045	6	20.00	3	20.0	EPR	17.55	0.59
901044	6	20.00	0	0.0	EPR	17.34	0.59

SID = simulation ID; OP = period of re-optimization; TOV = turnover constraint; Rtri = rebalancing trigger; ERET = model description; GM = geometric mean; Shrp = Sharpe ratio.

REGR (technique, period, equation)

Technique = OLS for ordinary least-squares regression analysis,
LRR for latent root regression,
ROB for robust regression,
WLRR for weighted latent root regression;

Period = 1S for one-period semi-annual analysis,
2S for two-period semi-annual analysis,
3S for three-period semi-annual analysis,
1Q for one-period quarterly analysis,
4Q for four-period quarterly analysis;

Equation = 4; $TRR = a_0 + a_1 EPR + a_2 BPR + a_3 CPR + a_4 SPR + a_5 REPR + a_6 RPBR + a_7 RCPR + a_8 RSPR + e_t$

8; $TRR = a_0 + a_1 EPR + a_2 BPR + a_3 CPR + a_4 SPR + e_t$

9.1; $TRR = a_0 + a_1 EPR + a_2 BPR + a_3 CPR + a_4 SPR + a_5 REPR(2) + a_6 RPBR(2) + a_7 RCPR(2) + a_8 RSPR(2) + e_t$,

where (2) denotes 2-year averages of relative variables.

9.2; $TRR = a_0 + a_1 EPR + a_2 BPR + a_3 CPR + a_4 SPR + a_5 REPR(3) + a_6 RPBR(3) + a_7 RCPR(3) + a_8 RSPR(3) + e_t$,

where (3) denotes 3-year averages of relative variables.

8. FURTHER ESTIMATIONS OF A COMPOSITE EQUITY VALUATION MODEL

This section exposes the reader to issues of databases and the inclusion of variables in composite models to identify undervalued securities. The database for this analysis is created by the use of all securities listed on the Compustat database, the I/B/E/S database, and the Center for Research in Security Prices (CRSP) database during the 1987-2001 period. The annual Compustat file contains some 399 data items from the company income statement, balance sheet, and cash flow statement during the 1950-2001 period. The I/B/E/S database contains all earnings forecasts made during the 1976-2001 period. The CRSP file contains monthly stock prices, shares outstanding, trading volumes, and returns for all traded securities from 1926-2001.

There are a seemingly infinite number of financial variables that may be tested for statistical association with monthly security returns. Bloch, Guerard, Markowitz, Todd, and Xu (1993) tested a set of fundamental variables in the U.S. during the 1975-1990 period. Guerard (1997) tested a set of I/B/E/S variables for the 1982-1994 period. In this study, we test the variables of these two studies using both fundamental and expectation data. We initially test the effectiveness of the individual variables using the information coefficients (ICs) rather than the upper quintile excess returns or the excess returns of individual variable portfolio optimizations. The information coefficient is the slope of the regression estimation in which ranked subsequent security returns are a function of the ranked financial strategy. The advantage of the IC approach is that the slope has a corresponding t-statistic that allows one to test the null hypothesis that the strategy is uncorrelated with subsequent returns. In developing a composite model, one seeks to combine variables that are statistically associated with subsequent returns. Let us define the variables tested in this chapter.

EP = earnings per share / price per share;
BP = book per share / price per share;
CP = cash flow per share / price per share;
SP = sales per share / price per share;
DY = dividend yield, dividend per share / price per share;
NCAV = net current asset value, net current assets per share / price per share;
FEP1= one-year-ahead forecast earnings per share / price per share;
FEP2= two-year-ahead forecast earnings per share / price per share;

RV1= one-year-ahead forecast earnings per share monthly revision / price per share;
RV2= two-year-ahead forecast earnings per share monthly revision / price per share;
BR1= one-year-ahead forecast earnings per share monthly breadth / price per share;
BR2= two-year-ahead forecast earnings per share monthly breadth/ price per share;

A consensus earnings-per-share I/B/E/S forecast, revisions and breadth variable, CTEF, has been created and tested using I/B/E/S data since January 1976.

The monthly ICs for all traded securities during the January 1990 – December 2001 period for these variables are shown in Table 6. The majority of the variables are statistically associated with stockholder returns, a result consistent with the Bloch et. al. and Guerard studies. The reader must remember that a t-statistic exceeding 1.96 is statistically significant at the 5% level. We report the Guerard and Mark (2004) results for the 1990-2001 period in Tables 6 and 7.

Table 6. Monthly Information Coefficients, 1990-2001

Variable	IC (t)
EP	.047 (41.71)
BP	.011 (10.04)
CP	.039 (34.52)
SP	.009 (7.52)
DY	.052 (40.57)
NCAV	-.006 (-4.52)
FEP1	.042 (34.60)
FEP2	.030 (24.68)
RV1	.038 (13.16)
RV2	.026 (8.56)
BR1	.043 (25.06)
BR2	.037 (25.06)
CTEF	.049 (40.57)

The results of Table 6 support the estimation of the composite security valuation model reported in Guerard, Gultekin, and Stone (1997). The model incorporates reported earnings, book value, cash flow, and sales, the corresponding relative variables, and an equally-weighted composite model of earnings forecasts, revisions, and breadth. One notes that the statistical significance of the CTEF variable is quite similar to the one-year-ahead eps breadth.

We estimate a similar monthly model for the January 1990 – December 2001 period.

$$\begin{aligned} TR_{t+1} &= a_0 + a_1EP_t + a_2BP_t + a_3CP_t + a_4SP_t + a_5REP_t \\ &+ a_6RBP_t + a_7RCP_t \\ &+ a_8RSP_t + a_9CTEF_t + e_t \end{aligned} \tag{13}$$

where:
EP = [earnings per share]/[price per share] = earnings-price ratio;
BP = [book value per share]/[price per share] = book-price ratio;
CP = [cash flow per share]/[price per share] = cash flow-price ratio;
SP = [net sales per share]/[price per share] = sales-price ratio;
REP = [current EP ratio]/[average EP ratio over the past five years];
RBP = [current BP ratio]/[average BP ratio over the past five years];
RCP = [current CP ratio]/[average CP ratio over the past five years];
RSP = [current SP ratio]/[average SP ratio over the past five years];
CTEF = consensus earnings-per-share I/B/E/S forecast, revisions and breadth; and, e = randomly distributed error term.

Time-Average Value of Estimated Coefficients

a1	a2	a3	a4	a5	a6	a7	a8	a9
.041	.047	.048	.037	.095	.071	.109	.152	.353

The monthly ordinary least squares (OLS) regression are plagued with approximately twice the number observations outside the 95 percent confidence interval as one might expect given a normal distribution of residuals. These aberrant observations, or outliers, lead us to re-estimate the monthly regression lines using a Beaton-Tukey bi-weight (or robust, ROB) regression technique, in which each observation is weighted as the inverse function of its OLS residual. The application of the Beaton-Tukey ROB procedure addresses the issue of outliers. The weighted data is plagued with multicollinearity, the correlation among the independent variables, which may lead to statistically inefficient estimates of the regression coefficients. Bloch et. al. (1993) and Guerard, Takano, and Yamane (1993) applied latent root regression (LRR) to the ROB-weighted data, referred to as weighted latent root regression, WLRR, and produced models with higher in-sample F-statistics and higher out-of-sample geometric means using WLRR than ROB and OLS techniques.[4] We create a composite model weight using the average weight of the positive coefficients of the preceding 12 monthly regressions, a monthly equivalent to the four-quarter averaging techniques used in Guerard, Gultekin, and Stone (1997). One notes the large weighting of the CTEF variable, and the relatively small weighting of the BP variable, a result consistent with Guerard, Gultekin and Stone (1997). In terms of information coefficients, ICs, the use of the WLRR procedure produces the highest IC for the models during the 1990-2001 period.

Table 7. ICs of the Composite Security Valuation Model

Technique	IC (t)
Equal-Weighted (EQ)	.031 (27.88)
OLS	.032 (31.29)
ROB	.038 (37.22)
WLRR	.040 (38.84)

The WLRR technique produces the largest and most statistically significant IC; a result consistent with the previously noted studies and the GPRD example.[5] The t-statistics on the composite model exceed the t-statistics of its components. The purpose of a composite security valuation model is to identify the determinants of security returns, and produce a statistically significant out-of-sample ranking metric of total returns.

An indication of the relative importance of the eight fundamental and the composite earnings forecasting variables is given by the time average value of the regression coefficients estimated for each year in our 1990-2001 study period. These time average values are tabulated at below equation (11). They support the low P-E (high earnings yield) approach to value investing advocated by Graham and Dodd [1934, 1962] and validated as a cross-sectional return anomaly by Basu [1977]. They also support the Fama and French [1992, 1995] finding that the book-to-market ratio is an important variable for explaining the cross-section of security returns. However, while both these variables are significant in explaining returns, the majority of the forecast performance is attributable to other model variables, namely the relative earnings-to-price, the relative cash-to-price, relative sales-to-price, and earnings forecast variable. The most statistically significant variable in identifying security returns is the composite earnings forecast variable. We will use the nine factor composite model in Chapter 21 to rank international securities.

Notes

[1]R. G. Ibbotson and R.A. Sinquefield, *Stocks, Bonds, Bills, and Inflation* (SBBI), updated in *Stocks, Bonds, Bills, and Inflation 2004 Yearbook.* Chicago: Ibbotson Associates. All rights reserved. The authors accessed the data via the WRDS, University of Pennsylvania.

[2]Tell someone at Chillkoot's in Anchorage that they have homogeneous beliefs and you may be paying a visit to your dentist (or neighborhood morgue).

[3]Mr. Markowitz was kind enough to read this chapter (actually chapters 14 and 15). Harry reminded me that "It is commonly but incorrectly asserted that Sharpe's 1964 CAPM article assumes a one-factor model of covariance. This is not true. Sharpe's 1963 Simplified Portfolio Selection article presents the one-factor model. His 1964 article shows that—*no matter what the (nonsingular) covariance model*—if all investors all seek mean-variance efficiency, all have the same beliefs **and all can borrow all they want at the risk-free rate,** then in equilibrium the expected (return minus risk-free rate) of each security is proportional to its regression against return on the market portfolio". The authors are indebted to Mr. Markowitz for his kindly reminder and greatly appreciate his review of the materials. Obviously any errors remaining are the responsibility of the authors.

[4]Robust regression techniques do not assume, as does ordinary least squares, that all regression data is equally-weighted. Robust regression techniques are used to re-weight the data inversely with the OLS residual; i.e., the larger the residual, then the lower is the weight. The authors use the Beaton-Tukey (1974) bi-weight regression weighting scheme. The average Beaton-Tukey observation weight is approximately 0.92 in the results reported in Guerard and Mark (2003), as opposed to 1.0 in OLS.

[5]If one updates Table 7 for the Russell 3000 securities for the January 1990-December 2003 period, one finds the following results:

Model	IC (t)
CTEF	0.035 (23.78)
EVL	0.023 (15.00)
EQ	0.031 (20.88)
EP	0.036 (24.33)
BP	0.025 (16.75)
WLRR	0.045 (30.21)

We add an EVL, an equal-weighted composite model of valuation factors, the EP, BP, CP, SP, REP, RBP, RCP, and RSP variables. The WLRR technique continues to produce statistically significant stock selection information in the US. The reader is referred to Guerard, Takano, and Yamane for a discussion of the regression procedures and Guerard (2006) for a presentation of the updated regression modeling and information coefficients for the 1993-2003 period.

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Problem

1. Given the following means, standard deviations, and covariance matrix, what is the expected return and standard deviation of an equally-weighted portfolio and one composed of 30% A, 30% B, and 40% C ? Is risk diversification possible with these securities? Why?

Stock	Mean	Standard Deviation	Beta
A	20.0%	28.0%	1.25
B	15	19.0	0.90
C	25	30.0	1.45
Market	12	20.0	

Correlation Matrix

	A	B	C
A	1.000	0.753	0.240
B	0.753	1.000	0.010
C	0.240	0.010	1.000

Discuss the risk-return tradeoffs inherent in the Capital Asset Pricing model and its relationship to the Capital Market Line and the Security Market Line.

Chapter 15

MULTI-FACTOR RISK MODELS

The previous chapter introduced the reader to Markowitz mean-variance analysis and the Capital Asset Pricing Model. The cost of capital calculated in Chapter 10 assumes that the cost of equity is derived from the Capital Asset Pricing Model and its corresponding beta, or measure of systematic risk. The Gordon Model, used for equity valuation in Chapter 8, assumes that the stock price will fluctuate randomly about its fair market value. The cost of equity is dependent upon the security beta. In this chapter, we address the issues inherent in a multi-beta, or multiple factor risk model. Accurate characterization of portfolio risk requires an accurate estimate of the covariance matrix of security returns. A relatively simple way to estimate this covariance matrix is to use the history of security returns to compute each variance, covariance and security beta. The use of beta, the covariance of security and market index returns, is one method of estimating a reasonable cost of equity funds for firms. However, the approximation obtained from simple models may not yield the best possible cost of equity. The simple, single index beta estimation approach suffers from two major drawbacks:

- Estimating a covariance matrix for the Russell 3,000 stocks requires a great deal of data;
- It is subject to estimation error. For example, in the previous chapter, the reader saw that the estimated correlation between two stocks such as DuPont and IBM, had a higher correlation than that between DuPont and Dominion Resources. However, one might expect a higher correlation between DuPont and Dow than between DuPont and IBM, given that DuPont and Dow are both chemical firms.

Taking this further, one can argue that firms with similar characteristics, such as firms in their line of business, should have returns that behave similarly. For example, DuPont, IBM, and Dominion Resources will all have a common component in their returns because they would all be affected by news that affects the stock market, measured by their respective betas. The degree to which each of the three stocks responds to this stock market component depends on the sensitivity of each stock to the stock market component.

Additionally, one would expect DuPont and Dow to respond to news affecting the chemical industry, whereas IBM and Dell would respond to news affect the Computer industry. The effects of such news may be captured by the average returns of stocks in the chemical industry and the petroleum industry. One can account for industry effects in the following representation for returns:

$$\begin{aligned}\tilde{r}_{DD} &= E[\tilde{r}_{DD}] + \beta \cdot [\tilde{r}_M - E[\tilde{r}_M]] \\ &\quad + 1 \cdot [\tilde{r}_{CHEMICAL} - E[\tilde{r}_{CHEMICAL}]] + 0 \cdot [\tilde{r}_P - E[\tilde{r}_{DD}]] + \mu_P\end{aligned} \tag{1}$$

where:

$\tilde{r}_{DD}$ = DD's realized return,
$\tilde{r}_M$ = the realized average stock market return,
$\tilde{r}_C$ = realized average return to chemical stocks,
$\tilde{r}_P$ = the realized average return to petroleum stocks,
$E[.]$ = expectations
β_{DD} = DD's sensitivity to stock market returns, and
μ_{DD} = the effect of DD specific news on DD returns.

This equation simply states that DD's realized return consists of an expected component and an unexpected component. The unexpected component depends on any unexpected events that affect stock returns in general $[\tilde{r}_M - E[\tilde{r}_M]]$, any unexpected events that affect the chemical industry $[\tilde{r}_C - E[\tilde{r}_C]]$, and any unexpected events that affect DD alone (μ_{DD}). Similar equations may be written for IBM and Dominion Resources.

The sources of variation in DD's stock returns, thus, are variations in stock returns in general, variations in chemical industry returns, and any variations that are specific to DD. Moreover, DD and Dow returns are likely to move together because both are exposed to stock market risk and chemical industry risk. DD , IBM, and D, on the other hand, are likely to move together to a lesser degree because the only common component in their returns in the market return.

By beginning with our intuition about the sources of co-movement in security returns, Rosenberg (1974) made substantial progress in estimating the covariance matrix of security returns. Rosenberg (1974) is the covariance matrix of common sources in security returns, the variances of security specific returns, and estimates of the sensitivity of security returns to the common sources of variation in their returns, creating the BARRA risk model. Because the common sources of risk are likely to be much fewer than the number of securities, we need to estimate a much smaller covariance matrix and hence a smaller history of returns is required. Moreover, because similar stocks are going to have larger sensitivities to similar common sources of risk, similar stocks will be more highly correlated than dissimilar stocks.

1. BARRA MODEL MATHEMATICS

The BARRA risk model is a multiple factor model (MFM). MFMs build on single-factor models by including and describing the interrelationships among factors.[1] For single-factor models, the equation that describes the excess rate of return is:

$$\tilde{r}_j = X_j \tilde{f} + \tilde{u}_j \tag{2}$$

where:

$\tilde{r}_j$ = total excess return over the risk-free rate,

X_j = sensitivity of security j to the factor,

$\tilde{f}_j$ = rate of return on the factor, and

$\tilde{u}_j$ = nonfactor (specific) return on security j.

We can expand this model to include K factors. The total excess return equation for a multiplier-factor model becomes:

$$\tilde{r}_j = \sum_{k=1}^{K} X_{jk} \tilde{f}_k + \tilde{u}_j \tag{3}$$

where:

X_{jk} = risk exposure of security j to factor k, and

$\tilde{f}_k$ = rate of return on factor k.

Note that when K=1, the MFM equation reduces to the earlier single-factor version; the CAPM addressed in the previous chapter.

When a portfolio consists of only one security, Equation 3 describes its excess return. But most portfolios comprise many securities, each representing a proportion, or weight, of the total portfolio. When weights $h_{p1,}$ $_h$p2, …, h_{pN} reflect the proportions of N securities in portfolio P, we express the excess return in the following equation:

$$\tilde{r}_p = \sum_{k=1}^{K} X_{Pk} \tilde{f}_k + \sum_{j=1}^{N} h_{Pj} \tilde{u}_j \tag{4}$$

where:

$$X_{Pk} = \sum_{j=1}^{N} h_{Pj} X_{jk}$$

This equation includes the risk from all sources and lays the groundwork for further MFM analysis.

2. RISK PREDICTION WITH MFMS

Investors look at the variance of their total portfolios to provide a comprehensive assessment of risk. To calculate the variance of a portfolio, one needs to calculate the covariances of all the constituent components. Without the framework of a multiple-factor model, estimating the covariance of each asset with every other asset is computationally burdensome and subject to significant estimation errors. Let us examine the risk structure of the BARRA MFM.

Figure 1

$$V(I,j) = \text{Covariance}\,[r(\tilde{i}), r(\tilde{j})]$$

where V (i,j) = asset covariance matrix, and

i,j = individual stocks.

$$V = \begin{bmatrix} V(1,1) & V(1,2) & \cdots & V(1,N) \\ V(2,1) & V(2,2) & \cdots & V(2,N) \\ V(3,1) & V(3,2) & \cdots & V(3,N) \\ \vdots & \vdots & & \vdots \\ V(N,1) & V(N,2) & \cdots & V(N,N) \end{bmatrix}$$

The BARRA MFM simplifies these calculations dramatically, replacing individual company profiles with categories defined by common characteristics (factors). The specific risk is assumed to be uncorrelated among the assets and only the factor variances and covariances are calculated during model estimation. Let us briefly review how Barr Rosenberg initially estimated the BARRA factor structure.

Figure 1

$$\tilde{r} = X\tilde{f} + \tilde{u}$$

where $\tilde{r}$ = vector of excess returns,
X = exposure matrix,
$\tilde{f}$ = vector of factor returns, and
$\tilde{u}$ = vector of specific returns.

$$\begin{bmatrix} \tilde{r}(1) \\ \tilde{r}(2) \\ \vdots \\ \tilde{r}(N) \end{bmatrix} = \begin{bmatrix} X(1,1) & X(1,2) & \dots & X(1,K) \\ X(2,1) & X(2,2) & \dots & X(2,K) \\ \vdots & \vdots & & \vdots \\ X(N,1) & X(N,2) & \dots & X(N,K) \end{bmatrix} \begin{bmatrix} \tilde{f}(1) \\ \tilde{f}(2) \\ \vdots \\ \tilde{f}(K) \end{bmatrix} + \begin{bmatrix} \tilde{u}(1) \\ \tilde{u}(2) \\ \vdots \\ \tilde{u}(N) \end{bmatrix}$$

The Rosenberg MFM framework was developed and estimated in Rosenberg's study with McKibbben (1973) and the Rosenberg extra-market component study (1974), in which security specific risk could be modeled as a function of financial descriptors, or known financial characteristics of the firm. The financial characteristics that were mi statistically associated with beta during the 1954-1970 period were:

(1) Latest annual proportional change in earnings per share;
(2) Liquidity, as measured by die quick ratio;
(3) Leverage, as measured by die senior debt-to-total assets ratio;
(4) Growth measure of earnings per share;
(5) Book-to-Price ratio;
(6) Historic beta;
(7) Logarithm of stock price;
(8) Standard deviation of earnings per share growth;
(9) Gross plant per dollar of total assets;
(10) Share turnover.

Rosenberg et al. (1975), Rosenberg and Marathe (1979), and Rudd and Rosenberg (1979, 1980) expanded upon the initial Rosenberg MFM framework.

The statistically significant determinants of the security systematic risk became the basis of the BARRA E1 Model risk indexes. The domestic BARRA E3 (USE3) model uses 13 sources of factor, or systematic, exposures. The sources of extra-market factor exposures are volatility, momentum, size, size non-linearity, trading activity, growth, earnings yield, value, earnings variation, leverage, currency sensitivity, dividend yield, and non-estimation universe.

The multiple-factor model, significantly reduces the number of calculations. For example, in the U.S. Equity Model (US-E3), 65 factors capture the risk characteristics of equities. This reduces the number of covariance and variance calculations; moreover, since there are fewer parameters to determine, they can be estimated with greater precision. The BARRA USE3 factor index definitions are shown in Appendix A. The BARRA risk management system begins with the MFM equation:

$$\tilde{r}_i = X\tilde{f} + \tilde{u} \tag{5}$$

where:

$\tilde{r}_i$ = excess return on asset I,
X = exposure coefficient on the factor,
$\tilde{f}$ = factor return, and
$\tilde{u}$ = specific return.

Substituting this relation in the basic equation, we find that:

$$\text{Risk} = \text{Var}(\tilde{r}_j) \tag{6}$$

$$= \text{Var}(X\tilde{f} + \tilde{u}) \tag{7}$$

Using the matrix algebra formula for variance, the risk equation becomes:

$$\text{Risk} = XFX^T + \Delta \tag{8}$$

where:

X = exposure matrix of companies upon factors,
F = covariance matrix of factors,
X^T = transpose of X matrix, and
Δ = diagonal matrix of specific risk variances.

This is the basic equation that defines the matrix calculations used in risk analysis in the BARRA equity models.

3. THE BARRA MULTI FACTOR MODEL AND ANALYSTS' FORECASTS, REVISIONS, AND BREADTH

Let us address the estimated earnings forecasting components of the CTEF model discussed in the previous chapter for the Russell 3000 universe during the 1990-2001 period. The CTEF model produced not only higher

ICs than its components (the reader is referred to Table 6 of Chapter 14), but also higher and more statistically significant asset selection than its components in the Russell 3000 universe. See Table 1 for Russell 3000 earnings component results in which portfolios of approximately 100 stocks are produced by tilting on the individual and component CTEF factors. The forecast earnings for share for the one-year-ahead and two-year-ahead periods, FEP1 and FEP2, offer negative, but statistically insignificant asset selection. The total active returns are positive, and not statistically significant. The asset selection is negative because the FEP variables have positive and statistically significant loadings on the risk indexes; particularly the earnings yield index. The factor loading of the FEP variables on the earnings yield risk index is not unexpected, given that the earnings yield factor index in the USE3 includes the forecast earnings-to-price variable. Thus, there is no multiple factor model benefit to the FEP variables.

Table 1. Multi-Factor Related Asset Selection of the Components of the Composite Earnings Forecasting Variable, 1990-2001 Russell 3000 Universe

R3000 Earnings Analysis	Total Active	T-stat	Asset Selection	T-stat	Risk Index	T-stat	Sectors	T-stat
FEP1	2.14	1.61	-1.18	-1.17	**4.20**	**4.42**	-0.86	-1.34
FEP2	1.21	0.91	-1.43	-1.35	**3.33**	**3.35**	-0.78	-1.15
RV1	0.76	0.69	0.34	0.42	0.92	1.46	-0.34	-0.89
RV2	1.40	1.37	1.09	1.31	0.81	1.42	-0.39	-1.08
BR1	**2.59**	**2.83**	**1.85**	**2.43**	**1.08**	**2.15**	-0.20	-0.51
BR2	**2.43**	**2.36**	**1.51**	**1.75**	**1.09**	**2.04**	-0.01	-0.02
CTEF	**2.87**	**2.81**	**2.07**	**2.66**	**1.19**	**1.70**	-0.26	-0.66

Bold figures denote statistically significant coefficients at the 10 percent level.
Table 1 is derived from Guerard and Mark (2003).

The monthly revision variables, the RV variables, offer no statistically significant total active returns, or asset selection abilities. The breadth variables, BR, produce statistically significant total active returns and asset selection, despite a statistically significant risk index loading. The breadth variable load on the earnings yield and growth risk indexes. Let us take a closer look at the BR1 factor risk index loading. The BR1 variable leads a portfolio manager to have a positive average active exposure to the earnings yield index, which incorporates the analyst predicted earnings-to-price and historic earnings-to-price measures. The BR1 tilt has a negative and statistically significant average exposure to size, non-linearity, the cube of normalized market capitalization. This result is consistent with analyst revisions being more effective in smaller capitalized securities. The BR1 variable tilt leads the portfolio manager to have a positive and statistically significant exposure to the growth factor index, composed of the growth in the dividend payout ratio, the growth rates in total assets and earnings per share during the past five years, recent one year earnings growth, and the variability in capital structure. Furthermore, the one-year-ahead BR is slightly better than the two-year-ahead BR, a result consistent with Stone, Guerard, Gultekin, and Adams (2002). The CTEF variable produces statistically significant total active returns and asset selection. The CTEF variable loading on the risk index is statistically significant at the 10 percent level because of its loading on the earnings yield and non-linear size indexes, as was the case with its breadth components. There are no statistically significant sector exposures in the CTEF variable. The CTEF model offers statistically significant asset selection in a multiple factor model framework. See Guerard and Mark (2004) for a more complete discussion of the earnings forecasting alpha work within the BARRA system.

The Frank Russell large market capitalization universe (the Russell 1000), middle market capitalization (mid cap), small capitalization (Russell 2000) and small- and middle market capitalization (Russell 2500) universes are used in the tests in this chapter. See Table 2. One can test the equally weighted composite model, CTEF, of I/B/E/S earnings forecasts, revisions, and breadth, described in the previous section. The portfolio optimization algorithm seeks to maximize the ranking of the CTEF variable while minimizing risk. The underlying CTEF variable is statistically significant, having a monthly information coefficient of 0.049 over the 491,119 observations. The CTEF variable is used as the portfolio tilt variable in the ITG optimization system using the BARRA risk model, and statistically significant total excess returns are found in the Frank Russell universes. One can create 100 stock portfolios monthly during the 1990-2001 period. A lambda tilt value of one is initially used in producing efficient portfolios. Active returns rise as the average stock size diminishes a result consistent with the inefficient markets literature summarized in Dimson (1977) and Ziemba (1992). The highest total active returns are found in the Russell 2000 stocks, the smallest stocks in the largest 3000 stocks in the Frank Russell universes, each year, see Table 2. The CTEF tilt variable does produce statistically significant sector exposures in the Russell 2000 stocks, as reported in Table 2, as we previously noted in the Russell 3000 universe.

Table 2. Risk and Return of Mean-Variance Efficient Portfolios, 1990-2001

Universe	Total Active	t-value	Asset Selection	t-value	Risk Index	t-value	Sectors	t-value
RMC	1.98	1.37	0.99	0.86	0.97	1.45	-0.88	-0.97
R1000	2.47	2.52	1.85	2.12	0.82	2.13	-.11	-.23
R2500	7.76	4.37	6.48	3.96	1.61	2.85	-0.33	-0.62
R2000	9.68	5.83	8.81	5.57	0.90	2.36	-.02	-.07

where RMC = Frank Russell Mid Cap Universe
R1000 = Frank Russell Largest 1000 Stock Universe,
R2000 = Frank Russell Small Cap Universe,
R2500 = Frank Russell Small and Mid Cap Universe

The CTEF variable produces statistically significant asset selection in the Russell 1000 universe, during the 1990-2001 period. The reader is referred to Table 3. The risk index exposure is statistically significant in the Russell 1000 university. The factor exposures of the CTEF variable in the Russell 1000 universe are shown in Table 4. The CTEF variable has statistically significant factor loadings on earnings yield and growth, as was the case in the Russell 3000 universe.

Table 3. CTEF Variable, Russell 1000 Universe

Attribution Report
Annualized Contributions To Total Return

Source of Return	Contribution (% Return)	Risk (% Std Dev)	Info Ratio	T-Stat
Risk Free	4.93	N/A	N/A	N/A
Total Benchmark	13.58	14.52		
Market Timing	-0.02	0.25	-0.18	-0.61
Risk Indices	0.82	1.16	0.62	2.13
Sectors	-0.11	1.01	-0.07	-0.23
Asset Selection	1.85	2.76	0.61	2.12
Total Exceptional Active	2.54	3.07	0.75	2.59
Total Active	2.47	3.07	0.73	2.52
Total Managed	16.04	14.96		

The total active return of CTEF variable for the Russell 2000 universe is shown in Table 5. Active returns to the CTEF variable are much larger in the Russell 2000 stocks than in the Russell 1000 stocks. The CTEF variable produces statistically significant asset selection, and significant factor exposures, primarily due to the earnings yield exposure. The earnings forecasting variable produces over 600 basis points annually of greater asset selection in the Russell 2000 universe than it does in the Russell 1000 universe. Earnings forecasts, revisions, and breadth generate greater asset selection in small stock universes than in larger stock universes. Moreover, as the firm size decreases, the CTEF variable is more statistically associated with risk index returns, such as earnings yield. The factor exposures increase as the size of firms decrease. The earning yield variable loading is statistically significant in the Russell 2000 universe.

Table 4. CTEF Variable Factor Exposures, Russell 1000 Universe

Attribution Analysis
Annualized Contributions To Risk Index Return

Source of Return	Average Active Exposure	Contribution (% Return)			Total		
		Average [1]	Variation [2]	Total [1+2]	Risk (% Std Dev)	Info Ratio	T-Stat
VOLATILITY	-0.01	0.01	-0.07	-0.06	0.17	-0.32	-1.12
MOMENTUM	0.12	-0.07	0.08	0.01	0.60	0.03	0.11
SIZE	-0.20	0.36	-0.09	0.27	0.93	0.24	0.83
SIZE NON-LINEARITY	-0.02	0.02	0.03	0.05	0.10	0.44	1.52
TRADING ACTIVITY	0.00	0.00	0.01	0.01	0.11	0.11	0.37
GROWTH	-0.05	0.05	0.03	0.08	0.14	0.48	1.65
EARNINGS YIELD	0.13	0.66	-0.12	0.55	0.40	1.20	4.13
VALUE	0.06	0.03	0.02	0.06	0.17	0.30	1.03
EARNINGS VARIATION	0.02	-0.02	0.00	-0.03	0.10	-0.21	-0.73
LEVERAGE	0.06	-0.01	-0.04	-0.04	0.17	-0.23	-0.80
CURRENCY SENSITIVITY	-0.02	0.01	-0.05	-0.04	0.11	-0.32	-1.11
YIELD	0.04	0.01	-0.04	-0.04	0.14	-0.24	-0.81
NON-EST UNIVERSE	0.00	0.00	0.01	0.01	0.04	0.20	0.68
Total				0.82	1.16	0.62	2.13

The BARRA risk model is an extra-market covariance model to describe the risk behavior of equity securities. Barr Rosenberg and his co-authors developed the BARRA system in the mid-to-late 1970s and the system has been a financial success, as it is now a company listed on NASDAQ (BARZ), with a market capitalization of some $ 800 million. The BARRA system was no means the only multi-factor or extra-market covariance model.

Table 5. CTEF Variable, Russell 2000 Universe

Attribution Analysis
Annualized Contributions To Total Return

Source of Return	Contribution (% Return)	Risk (% Std Dev)	Info Ratio	T-Stat
Risk Free	4.93	N/A	N/A	N/A
Total Benchmark	11.73	18.42		
Expected Active	-0.11	N/A	N/A	N/A
Market Timing	0.09	0.45	0.05	0.17
Risk Indices	0.90	1.11	0.68	2.36
Sectors	-0.02	0.95	0.02	0.07
Asset Selection	8.81	4.67	1.61	5.57
Total Exceptional Active	9.79	4.88	1.71	5.90
Total Active	9.68	4.88	1.69	5.83
Total Managed	21.41	17.67		

4. ALTERNATIVE MULTI-BETA RISK MODELS

Bernell Stone (1974) developed a two-factor index model which molded equity returns as a function of an equity index and debt returns. In recent years, Stone, Guerard, Gultekin, and Adams (2002) has developed a portfolio algorithm to generate portfolios that have similar stock betas (systematic risk), market capitalizations, divided yield, and sales growth cross-sections, such that one can access the excess returns of the analysts' forecasts, forecast revisions, and breadth model, as one moves from low (least preferred) to high (most preferred) securities with regard to your portfolio construction variable (i.e., CTEF). Excess returns similar to the excess returns to asset selection shown in Table 2 can be produced with Stone algorithm during the 1982-1998 period. Farrell (1973, 1997) estimated a four "factor" model extra-market covariance model. Farrell took an initial universe of 100 stocks in 1973 (due to computer limitations), and ran market models to estimate betas and residuals from the market model:

$$R_{j_t} = a_j + b_j R_{M_t} + e_j \tag{9}$$

$$e_{j_t} = R_{j_t} - \hat{a}_j - \hat{b}_j R_{M_T} \tag{10}$$

The residuals of equation (10) should be independent variables. That is, after removing the market impact by estimating a beta, the residual of IBM should be independent of Dow, Merck, or Dominion Resources. The residuals should be independent, of course, in theory. Farrell (1973) examined the correlations among the security residuals of equation (10) and found that the residuals of IBM and Merck were highly correlated, but the residuals of IBM and D (then Virginia Electric & Power) were not correlated. Farrell used a statistical technique known as Cluster Analysis to create clusters, or groups, of securities, having highly correlated market model residuals. Farrell found four clusters of securities based on his extra-market covariance. The clusters contained securities with highly correlated residuals that were uncorrelated with residuals of securities in the other clusters. Farrell referred to his clusters as "Growth Stocks" (electronics, office equipment, drug, hospital supply firms and firms with above-average earnings growth), "Cyclical Stocks" (Metals, machinery, building supplies, general industrial firms, and other companies with above-average exposure to the business cycle), "Stable Stocks" (banks, utilities, retailers, and firms with below-average exposure to the business cycle), and "Energy Stocks" (coal, crude oil, and domestic and international oil firms). In 1976, Ross published his "Arbitrage Theory of Capital Asset Pricing," which held that security returns were a function of several (4-5) economic factors. In 1986, Chen, Ross and Roll developed an estimated multi-factor security return model based on:

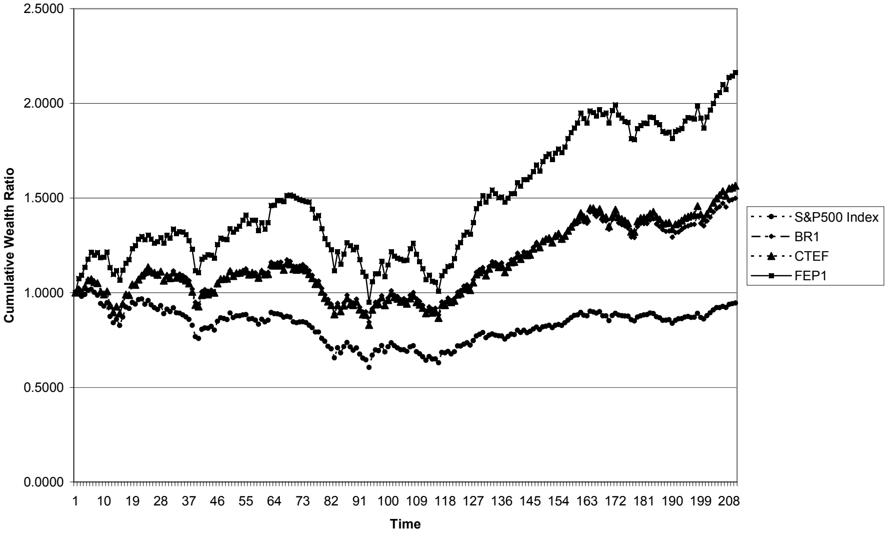
$$R = a + b_{MP}MP + b_{DEI}DEI + b_{UI}UI + b_{UPR}UPR + b_{UTS}UTS\ te_t \tag{11}$$

where MP = monthly growth rate of industrial production,
DEI = change in expected inflation,
UI = unexpected inflation,
UPR = risk premium,
and UTS = term structure of interest rates.

Chen, Ross, and Roll (CRR) defined unexpected inflation as the monthly (first) differences of the Consumer Price Index (CIP) less the expected inflation rate. The risk premia variable is the "Baa and under" bond return at time and less the long-term government bond return. The term structure variable is the long-term government bond return less the Treasury bill rates, known at time t-1, and applied to time t. When CRR applied their five factor model in conjunction with the value-weighted index betas, during the 1958-1984 period, the index betas are not statistically significant whereas the economic variables are statistically significant. The Stone, Farrell, and Chen, Ross, and Roll multi-factor model used 4-5 factors to describe equity security risk. The models used different statistical approaches and economic models to control for risk. The reader may now ask a simple question; if four or five betas are appropriate, why not estimate 20 betas? The important point is that the betas should be estimated on variables that are independent, or orthogonal, of the other variables. The estimation of 20 betas on orthogonal variables, 10-15 of which are not statistically significant, can produce the quite similar expected returns for securities as four or five betas estimated on economic variables, or pre-specified variables. Blin and Bender (1987-1997) estimated a 20 (factor) beta model of covariances based on 2.5 years of weekly stock returns data. The Blin and Bender Arbitrage Pricing Theory (APT) model followed the Ross factor modeling theory, but Blin and Bender estimated betas from 20 orthogonal factors. Blin and Bender never sought to identify their factors with economic variables.

In this section, we use a multi factor risk model of 20 betas described in Blin, Bender, and Guerard (1997). The Blin and Bender APT system has been developed for US and global markets, as well as for individual countries. We can demonstrate the effectiveness of portfolio construction using the Blin and Bender APT risk model and optimization system by creating mean-variance efficient portfolios in the US and EAFE countries during the December 2000-December 2004 period. The APT system allows the portfolio manager to replicate the market, with 20 orthogonally estimated betas, and tilting the portfolio toward variables that are associated with stock selection. For example, we can tilt the portfolio toward the earnings forecasting variables reported in Chapter 14. In Chart 1, one sees the effectiveness of using the FEP1 variable to create portfolios outperforming the S&P 500 Index during the December 2000-December 2004 period. The optimized portfolios are created with an upper bound of 4.00 percent on the security weight, a lower bound of 0.00 percent on the security weight, a threshold position of 0.0025 percent for adding a security to the portfolio. The 100-stock portfolios are re-balanced monthly assuming 100 basis points of round-trip transactions costs. One sees little different between the excess returns of portfolios using the one-year-ahead consensus composite earnings forecasting, CTEF, strategy. The Blin and Bender APT system using 20 factors of pure factor analysis; there are no pre-specified fundamental variables. One would have expected that the

Chart 1. U.S. Earnings Forecasting Strategy, 2000-2004

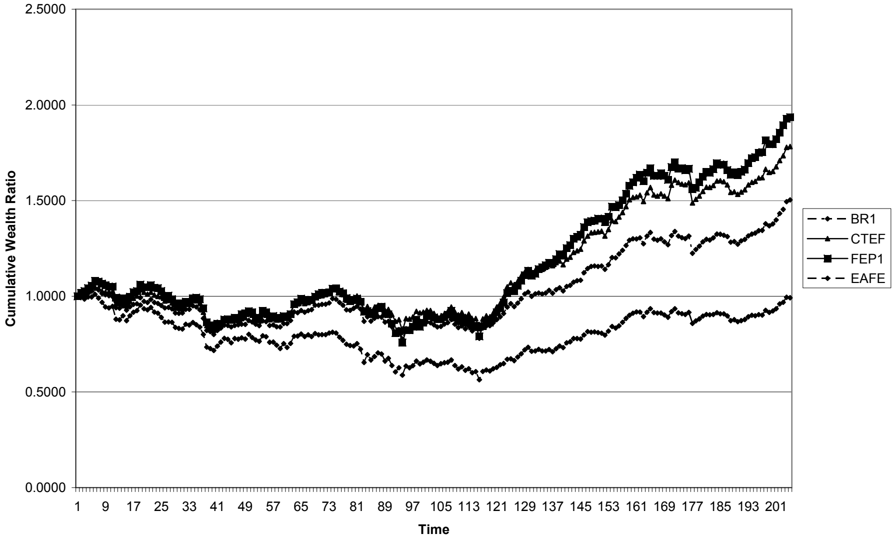


CTEF variable might produce higher portfolio excess returns than the FEP1 variable, given its relatively higher IC. The US earnings forecasting strategy offers substantial excess returns that incorporate realistic transactions costs and can be modified to incorporate liquidity measures.

In Chart2, one sees the effectiveness of using the FEP1 variable to create portfolios outperforming EAFE during the January 2000-December 2004 period. The optimized portfolios are created with an upper bound of 4.00 percent on the security weight, a lower bound of 0.00 percent on the security weight, a threshold position of 0.0025 percent for adding a security to the portfolio. The 100-stock portfolios are re-balanced monthly assuming 150 basis points of round-trip transactions costs. See Chart 2.

The portfolio standard deviations are approximately 16 percent for the FEP1 earnings forecasting strategy and the portfolio tracking errors are about 5.0 percent for the 100 stock portfolios.

Chart 2. EAFE Earnings Forecasting Portfolio Strategy, 2000-2004



The excess returns for the earnings forecasting strategies, adjusted for varying transactions costs, are similar for US and EAFE countries. Bloch, Guerard, Markowitz, Todd, and Xu (1993) reported that fundamentally-based equity strategies performed in very similar fashions in the US and Japanese equity markets. The results of Charts 1 and 2 suggest that the earnings forecasting variables are equally effective in identifying undervalued securities in the US and EAFE countries.

There is nothing magic about the 100-stock portfolios. Portfolios can be created using 50, 75, or 300 stocks that are equally effective, see Chart 3. The 100-stock portfolios offer the greatest excess returns, but there is no statistically significant difference in the excess returns on the various sized baskets if one employed the Markowitz and Xu (1994) data mining test.

Finally, let us investigate the impact of varying lambda, the measure of risk-aversion (a lambda of one is a very risk-averse person whereas a risk of 1000 implies that you are willing to tolerate risk to earn return) on the CTEF variable in the US and EAFE markets during the 2000-2004 period. One sees that as lambda rises, the number of stocks in the portfolios fall, the standard deviation and estimated tracking errors tends to rise, and the Sharpe Ratio rise. See Table 6. We have not constrained turnover in this analysis. The reader is reminded that turnover may be necessarily enhance portfolio returns, as was the case in Bloch, Guerard, Markowitz, Todd, and Xu (1993), but the Bloch et. al. analysis was primarily concerned with value-based variables that are generally less effected by turnover that forecasted earnings variables.

Chart 3. EAFE Earnings Forecasting Strategies with Various Stocks in Portfolios

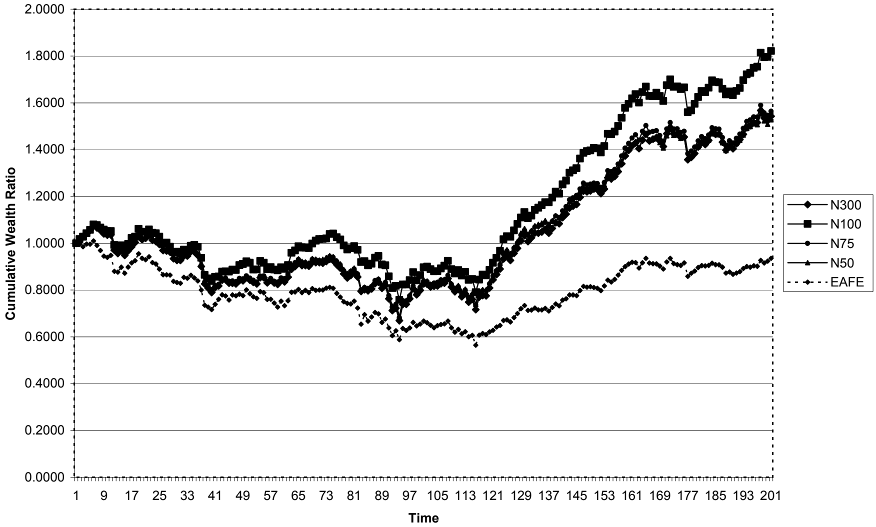


Table 6. Risk-Aversion and the Composite Earnings Forecasted Strategy, 2000- 2004

US	Lambda	N	Ann. AR	Ann. SD	Long Turnover	Tracking Error	Sharpe Ratio
CTEF	1	414.3	2.28	18.29	0.396	1.763	0.024
	5	239.3	6.66	18.29	0.677	3.049	0.264
	10	186.4	8.98	18.46	0.771	3.746	0.387
	20	144.0	11.90	18.63	0.844	4.510	0.540
	50	101.4	16.86	18.91	0.910	5.727	0.794
	100	79.0	20.65	17.22	0.934	6.766	1.092
	200	63.5	23.47	19.50	0.945	7.963	1.109
	500	48.4	28.31	20.21	0.957	9.781	1.310
	1000	39.9	32.88	21.22	0.961	11.308	1.463
S&P500 benchmark			-1.99	18.76			-0.204
EAFE							
CTEF	1	270.4	7.36	15.93	0.531	2.303	0.347
	5	199.7	12.00	15.25	0.734	3.170	0.666
	10	165.4	13.44	15.10	0.794	3.670	0.768
	20	133.2	15.14	15.08	0.840	4.269	0.882
	50	97.4	16.46	14.87	0.882	5.248	0.983
	100	75.5	17.30	14.88	0.906	6.166	1.039
	200	60.7	18.64	15.07	0.924	7.227	1.115
	500	45.4	18.74	15.56	0.940	8.949	1.086
	1000	37.7	17.92	15.98	0.944	10.321	1.006
EAFE benchmark			0.00	18.44			-0.100

One would use a lambda of 1000 in the US and a lambda of 500 in EAFE countries, respectively, to maximize the Sharpe Ratios.

This chapter addresses many aspects of estimating and using multi-factor models of risk. In Chapter 8, the reader was introduced to equity valuation models, which held that stock prices are functions of discounted expected dividends and cash buyouts. The usable equity discount rate can be determined by the multi-factor risk model, see Roll and Ross (1984).

5. SUMMARY AND CONCLUSIONS

Multi-factor risk models, MFM, may be used to analyze a stock selection, or valuating variable. The use of ICs may not produce similar results to the asset selection, models because one must remove the market effect and extra-market covariances to properly estimate the contribution of a variable to the creation of efficient portfolios which help determine the cost of equity capital.

Notes

[1]The reader is referred to the BARRA (USE 3) United States Equity, Version 3, Risk Model Handbook. The reader is also referred to Rosenberg and Marathe (1979), Rudd and Rosenberg (1980), and Grinhold and Kahn (1999).

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Appendix A:

US-E3 Descriptor Definitions

This Appendix gives the detailed definitions of the descriptors which underlie the risk indices in US-E3. The method of combining these descriptors into risk indices is proprietary to BARRA.

1. Volatility

i) *BTSG: Beta times sigma*

This is computed as $\sqrt{\beta\sigma_\varepsilon}$, where β is the historical beta and σ_ε is the historical residual standard deviation. If β is negative, then the descriptor is set equal to zero.

ii) *DASTD: Daily standard deviation*

This is computed as:

$$\sqrt{N_{days}\left[\sum_{t=1}^{T} w_t r_t^{\;2}\right]}$$

where r_t is the return over day t, w_t is the weight for day t, T is the number of days of historical returns data used to compute this descriptor (we set this to 65 days), and N_{days} is the number of trading days in a month (we set this to 23).

iii) *HILO: Ratio of high price to low price over the last month*

This is calculated as:

$$\log\left(\frac{P_H}{P_L}\right)$$

where P_H and P_L are the maximum price and minimum price attained over the last one month.

iv) *LPRI: Log of stock price*

This is the log of the stock price at the end of last month.

v) *CMRA: Cumulative range*

Let Z_t be defined as follows:

$$Z_t = \sum_{s=1}^{t} \log(1 + r_{i.s}) - \sum_{s=1}^{t} \log(1 + r_{f,s})$$

where $r_{i,s}$ is the return on stock I in month s, and $r_{f,s}$ is the risk-free rate for month s. In other words, Z_t is the cumulative return of the stock over the risk-free rate at the end of month t. Define Z_{max} and Z_{min} as the maximum and minimum values of Z_t over the last 12 months. CMRA is computed as:

$$\log\left(\frac{1 + Z_{max}}{a + Z_{min}}\right)$$

vi) *VOLBT: Sensitivity of changes in trading volume to changes in aggregate trading volume*

This may be estimated by the following regression:

$$\frac{\Delta V_{i,t}}{N_{i,t}} = a + b\,\frac{\Delta V_{M,t}}{N_{m.t}} + \xi_{i,t}$$

where $\Delta V_{i,t}$ is the change in share volume of stock I from week t-1 to week t, $N_{i,t}$ is the average number of shares outstanding for stock I at the beginning of week t-1 and week t, $\Delta V_{M,t}$ is the change in volume on the aggregate market from week t-1 to week t, and $N_{M,t}$ is the average number of shares outstanding for the aggregate market at the beginning of week t-1 and week t.

vii) *SERDP: Serial dependence*

This measure is designed to capture serial dependence in residuals from the market model regressions. It is computed as follows:

$$\text{SERDP} = \frac{\frac{1}{T-2}\sum_{t=3}^{T}(e_t + e_{t-1} + e_{t-2})^2}{\frac{1}{T-2}\sum_{t=3}^{T}(e^2{}_t + e^2{}_{t-1} + e^2{}_{t-2})}$$

where e_t is the residual from the market model regression in month t, and T is the number of months over which this regression is run (typically, T = 60 months).

viii) *OPSTD: Option-implied standard deviation*

This descriptor is computed as the implied standard deviation from the Black-Scholes option pricing formula using the price on the closest to at-the-money call option that trades on the underlying stock.

2. Momentum

i) *RSTR: Relative strength*

This is computed as the cumulative excess return (using continuously compounded monthly returns) over the last 12 months – i.e.,

$$\text{RSTR} = \sum_{t=1}^{T}\log(1 + r_{i,t}) - \sum_{t=1}^{T}\log(1 + r_{f,t})$$

where $r_{i,t}$ is the arithmetic return of the stock in month I, and $r_{f,t}$ is the arithmetic risk-free rate for month i. This measure is usually computed over the last one year – i.e., T is set equal to 12 months.

ii) *HALPHA: Historical alpha*

This descriptor is equal to the alpha term (i.e., the intercept term) from a 60-month regression of the stock's excess returns on the S&P 500 excess returns.

3. Size

i) *LNCAP: Log of Market capitalization*

This descriptor is computed as the log of the market capitalization of equity (price times number of shares outstanding) for the company.

4. Size Nonlinearity

i) *LCAPCB: Cube of the log of market capitalization*

This risk index is computed s the cube of the normalized log of market capitalization.

5. Trading Activity

i) *STOA: Share turnover over the last year*

STOA is the annualized share turnover rate using data from the last 12 months – i.e, it is equal to $V_{ann} / \overline{N}_{out}$, where V_{ann} is the total trading volume (in number of shares) over the last 12 months and $\overline{N}_{out}$ is the average number of shares outstanding over the previous 12 months (i.e., it is equal to the average value of the number of shares outstanding at the beginning of each month over the previous 12 months).

ii) *STOQ: Share turnover over the last quarter*

This is computed as the annualized share turnover rate using data from the most recent quarter. Let V_q be the total trading volume (in number of shares) over the most recent quarter and let $\overline{N}_{out}$ be the average number of shares outstanding over the period (i.e., $\overline{N}_{out}$ is equal to the average value of the number of shares outstanding at the beginning of each month over the previous three months). Then, STOQ is computed as $4V_q / \overline{N}_{out}$.

iii) *STOM: Share turnover over the last month*

This is computed as the share turnover rate using data from the most recent month – i.e., it is equal to the number of shares traded last month divided by the number of shares outstanding at the beginning of the month.

iv) *STO5: Share turnover over the last five years*

This is equal to the annualized share turnover rate using data from the last 60 months. In symbols, STO5 is given by:

$$\mathrm{STO5} = \frac{12\left[\dfrac{1}{T}\displaystyle\sum_{s=1}^{T} V_s\right]}{\sigma_\varepsilon}$$

where V_s is equal to the total trading volume in month s and $\overline{N}_{out}$ is the average number of shares outstanding over the last 60 months.

v) *FSPLIT: Indicator for forward split*

This descriptor is a 0-1 indicator variable to capture the occurrence of forward splits in the company's stock over the last two years.

vi) *VLVR: Volume to variance*

This measure is calculated as follows:

$$\mathrm{VLVR} = \log \frac{\dfrac{12}{T}\left[\displaystyle\sum_{s=1}^{T} V_s P_s\right]}{\sigma_\varepsilon}$$

where V_s equals the number of shares traded in month s, P_s is the closing price of the stock at the end of month s, and σ_ε is the estimated residual standard deviation. T he sum in the numerator is computed over the last 12 months.

6. Growth

i) *PAYO: Payout ratio over five years*

This measure is computed as follows:

$$\text{PAYO} = \frac{\frac{1}{T}\sum_{t=1}^{T} D_t}{\frac{1}{T}\sum_{t=1}^{T} E_t}$$

where D_t is the aggregate dividend paid out in year t and E_t is the total earnings available for common shareholders in year t. This descriptor is computed using the last five years of data on dividends and earnings.

ii) *VCAP: Variability in capital structure*

This descriptor is measured as follows:

$$\text{VCAP} = \frac{\frac{1}{T-1}\sum_{t=2}^{T}\left(|N_{t-1} - N_t|P_{t-1} + |LD_{t-1} - LD_t| + |PE_t - PE_{t-1}|\right)}{CE_T + LD_T + PE_T}$$

where N_{t-1} is the number of shares outstanding at the end of time t-1; P_{t-1} is the price per share at the end of time t-1; LD_{t-1} is the book value of long-term debt at the end of time period t-1; PE_{t-1} is the book value of preferred equity at the end of time period t-1; and $CE_T + LD_T + PE_T$ are the book values of common equity, long-term debt, and preferred equity as of the most recent fiscal year.

iii) *AGRO: Growth rate in total assets*

To compute this descriptor, the following regression is run:
$TA_{it} = a + bt + \xi_{it}$

Where TA_{it} is the total assets of the company as of the end of year t, and the regression is run for the period = 1, …, 5. AGRO is computed as follows:

$$\text{AGRO} = \frac{b}{\frac{1}{T}\sum_{t=1}^{T} TA_{it}}$$

where the denominator average is computed over all the data used in the regression.

iv) *EGRO: Earnings growth rate over last five years*

First, the following regression is run:

$EPS_t = a + bt + \xi_t$

Where EPS_t is the earnings per share for year t. This regression is run for ht eperiod t=1, …, 5. EGRO is computed as follows:

$$EGRO = \frac{b}{\frac{1}{T}\sum_{t=1}^{T} EPS_t}$$

v) *EGIBS: Analyst-predicted earnings growth*

This is computed as follows:

$$EGIBS = \frac{(EARN - EPS)}{(EARN + EPS)/2}$$

where EARN is a weighted average of the median earnings predictions by analysts for the current year and next year, and EPS is the sum of the four most recent quarterly earnings per share.

vi) *DELE: Recent earnings change*

This is a measure of recent earnings growth and is measured as follows:

$$DELE = \frac{(EPS_t - EPS_{t-1})}{(EPS_t + EPS_{t-1})/2}$$

where EPS_t is the earnings per share for the most recent year, and EPS_{t-1} is the earnings per share for the previous year. We set this to missing if the denominator is non-positive.

7. Earnings Yield

i) *EPIBS: Analyst-predicted earnings-to-price*

This is computed as the weighted average of analysts' median predicted earnings for the current fiscal year and next fiscal year divided by the most recent price.

ii) *ETOP: Trailing annual earnings-to-price*

This is computed as the sum of the four most recent quarterly earnings per share divided by the most recent price.

iii) *ETP5: Historical earnings-to-price*

This is computed as follows:

$$ETP5 = \frac{\frac{1}{T}\sum_{t=1}^{T} EPS_t}{\frac{1}{T}\sum_{t=1}^{T} P_t}$$

where EPS_t is equal to the earnings per share over year t, and P_t is equal to the closing price per share at the end of year t.

8. Value

i) *BTOP: Book –to-price ratio*

This is the book value of common equity as of the most recent fiscal year end divided by the most recent value of the market capitalization of the equity.

9. Earnings Variability

i) *VERN: Variability in earnings*

This measure is computed as follows:

$$\mathrm{VERN} = \frac{\left(\frac{1}{T-1}\sum_{t=1}^{T}\left(E_t - \bar{E}\right)^2\right)^{1/2}}{\frac{1}{T}\sum_{t=1}^{T} E_t}$$

where E_t is the earnings at time t(t=1,…,5) and $\bar{E}$ is the average earnings over the last five years. VERN is the coefficient of variation of earnings.

ii) *VFLO: Variability in cash flows*

This measure is computed as the coefficient of variation of cash flow using data over the last five years – i.e., it is computed in an identical manner to VERN, with cash flow being used in pace of earnings. Cash flow is computed as earnings plus depreciation plus deferred taxes.

iii) *EXTE: Extraordinary items in earnings*

This is computed as follows:

$$\mathrm{EXTE} = \frac{\frac{1}{T}\sum_{t=1}^{T}\left| EX_t + NRI_t \right|}{\frac{1}{T}\sum_{t=1}^{T} E_t}$$

where EX_t is the value of extraordinary items and discontinued operations, NRI_t is the value of non-operating income, and E_t is the earnings available to common before extraordinary items. The descriptor uses data over the last five years.

iv) *SPIBS: Standard deviation of analysts' prediction to price*

This is computed as the weighted average of the standard deviation of IBES analysts' forecasts of the firm's earnings per share for the current fiscal year and next fiscal year divided by the most recent price.

10. Leverage

i) *MLEV: Market leverage*

This measure is computed as follows:

$$\mathrm{MLEV} = \frac{\mathrm{ME}_t + \mathrm{PE}_t + \mathrm{LD}_t}{\mathrm{ME}_t}$$

where ME_t is the market value of common equity, PE_t is the book value of preferred equity, and LD_t is the book value of long-term debt. The value of preferred equity and long-tem debt are as of the end of the most recent fiscal year. The market value of equity is computed using the most recent month's closing price of the stock.

ii) *BLEV: Book leverage*

This measure is computed as follows:

$$\mathrm{BLEV} = \frac{\mathrm{CEQ}_t + \mathrm{PE}_t + \mathrm{LD}_t}{\mathrm{CEQ}_t}$$

where CEQ_t is the book value of common equity, PE_t is the book value of preferred equity, and LD_t is the book value of the long-term debt. All values are as of the end of the most recent fiscal year.

iii) *DTOA: Debt-to-assets ratio*

This ratio is computed as follows:

$$\mathrm{DTOA} = \frac{\mathrm{LD}_t + \mathrm{DCL}_t}{\mathrm{TA}_t}$$

where LD_t is the book value of long-term debt, DCL_t is the value of debt in current liabilities, and TA_t is the book value of total assets. All values are as of the end of the most recent fiscal year.

iv) *SNRRT: Senior debt rating*

This descriptor is constructed as a multi-level indicator variable of the debt rating of a company.

11. Currency Sensitivity

i) *CURSENS: Exposure to foreign currencies*

To construct this descriptor, the following regression is run:

$r_{it} = \alpha_I + \beta_i r_{mt} + \varepsilon_{it}$

where r_{it} is the excess return on the stock and r_{mt} is the excess return on the S&P 500 Index. Let ε_{it} denote the residual returns from this regression. These residual returns are in turn regressed against the contemporaneous and lagged returns on a basket of foreign currencies, as follows:

$$\varepsilon_{it} = c_i + \gamma_{i1}(FX)_t + \gamma_{i2}(FX)_{t-1} + \gamma_{13}(FX)_{t-2} + \mu_{it}$$

where ε_{it} is the residual return on stock I, $(FX)_t$ is the return on an index of foreign currencies over month t, $(FX)_{t-1}$ is the return on the same index of foreign currencies over month t-1, and $(FX)_{t-2}$ is the return on the same index over month t-2. The risk index is computed as the sum of the slope coefficients γ_{i1}, γ_{i2}, and γ_{i3} – i.e., CURSENS = $\gamma_{i1} + \gamma_{i2} + \gamma_{i3}$.

12. Dividend Yield

i) *P_DYLD: Predicted dividend yield*

This descriptor uses the last four quarterly dividends paid out by the company along with the returns on the company's stock and future dividend announcements made by the company to come up with a BARRA-predicted dividend yield.

13. Non-Estimation Universe Indicator

i) *NONESTU: Indicator for firms outside US-E3 estimation universe*

This is a 0-1 indicator variable: It is equal to 0 if the company is in the BARRA estimation universe and equal to 1 if the company is outside the BARRA estimation universe.

Chapter 16

OPTIONS

Options can be generalized as contracts which can be bought or sold at a given price enabling one to buy or sell an asset or a security at a possible future profit. If the profitable opportunity does not arise, the price paid for the option is foregone. An understanding of the theory and analysis of options is useful to the financial managers in enabling them to estimate trends and may be employed to temporarily secure assets until a decision is made whether to buy or not, and to hold on to new projects or innovations until a final decision.

Options are financial contracts that allow one to purchase or sell assets at a predetermined price up to an expiration date. Perhaps the most recognized traded options appear in the financial markets as put and call options on common stocks. Speculators use options because of their low initial cost and possible high returns. Common stock options have been traded on the Chicago Board Options Exchange (CBOE) since 1973. A call option gives its owner the right, not the obligation, to buy a specific number of shares of stocks at a specific price, known as the exercise price, up to the expiration date. A premium paid is the cost of purchasing the option. A buyer of the call option expects the stock price to rise. A seller or writer of the call option expects the stock price to decline or remain the same. The seller retains the premium whether or not the option is exercised.

Let us look at an example of a common stock purchase and an option valuation. The common stock price of IBM was \$84.71 on August 25, 2004. If a trader believed that IBM would appreciate in value during the coming months, he could purchase 100 shares of stock for \$8471 plus the brokerage commission. If IBM increases in value to \$90 per share, then the investor has secured profits of \$5.29 per share or \$529 on the 100 shares. The profit on such an investment is 6.25 percent.

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{\$90 - \$84.71}{84.71} = .0625$$

If we assume that the increase in stock occurred before the third Friday in September, the 6.25 percent return is approximately 74.98 percent, annually.

On the other hand, the price of IBM may fall or remain constant as well as it might rise. If the price of IBM fell to \$70.00 per share, then the loss on the stock is -17.37 percent, or some -208.38 percent, annualized.

$$R_t = \frac{\$70.00 - 84.71}{84.71} = -.1737$$

A trader could purchase an IBM call option on August 25 with various exercise or strike prices, shown in Table 1. For call options expiring in September 2004, one notes that the price one must pay for the call option is a function of the strike price. A call option is the right to purchase stock, and that right has value only if one expects the stock price to exceed the exercise price. The intrinsic value of a call option is its common stock price less its exercise price. Let us look at the premia on IBM call options in Table 1.

Table 1. IBM calls and Puts Data

INTERNATIONAL BUSINESS MACHINES(IBM) 84.71 ▲ +0.06

Symbol	Last	Time	Net	Bid	Ask	Reference price	Div freq	Div amt	Historical Volatility
IBM	84.71	08/24	+0.06	0.00	0.00	84.71	4	0.18	10.050%

Calls — Sep 2004 — Puts

Ticker	Last	T-Val	Delta	Gamma	Theta	Implied Volatility	Strike	Ticker	Last	T-Val	Delta	Gamma	Theta	Implied Volatility
.IBMIO	10.11	10.03	1.00	0.000	-0.003	26.93%	75	.IBMUO	0.10	0.00	-0.00	0.000	-0.000	27.52%
.IBMIP	5.40	5.04	0.99	0.007	-0.004	20.93%	80	.IBMUP	0.30	0.00	-0.01	0.007	-0.001	20.03%
.IBMIQ	1.30	0.84	0.51	0.195	-0.020	15.05%	85	.IBMUQ	1.25	0.79	-0.49	0.195	-0.016	15.26%
.IBMIR	0.10	0.01	0.01	0.012	-0.001	15.98%	90	.IBMUR	5.00	4.96	-0.99	0.012	0.003	16.67%
.IBMIS	0.05	0.00	0.00	0.000	-0.000	20.40%	95	.IBMUS	10.00	9.95	-1.00	0.000	0.004	22.90%

Calls — Oct 2004 — Puts

Ticker	Last	T-Val	Delta	Gamma	Theta	Implied Volatility	Strike	Ticker	Last	T-Val	Delta	Gamma	Theta	Implied Volatility
.IBMJO	10.10	9.88	1.00	0.001	-0.003	24.83%	75	.IBMVO	0.35	0.00	-0.00	0.001	-0.000	24.86%
.IBMJP	5.80	4.97	0.94	0.035	-0.007	20.54%	80	.IBMVP	0.85	0.08	-0.06	0.035	-0.003	20.95%
.IBMJQ	2.15	1.23	0.50	0.124	-0.014	18.04%	85	.IBMVQ	2.45	1.33	-0.50	0.124	-0.010	18.03%
.IBMJR	0.55	0.09	0.06	0.039	-0.004	16.68%	90	.IBMVR	5.50	5.18	-0.94	0.039	-0.000	17.65%
.IBMJS	0.15	0.00	0.00	0.002	-0.000	18.02%	95	.IBMVS	10.00	10.08	-1.00	0.002	0.004	20.39%

Calls — Jan 2005 — Puts

Ticker	Last	T-Val	Delta	Gamma	Theta	Implied Volatility	Strike	Ticker	Last	T-Val	Delta	Gamma	Theta	Implied Volatility
.IBMAO	11.10	10.34	0.98	0.009	-0.005	22.16%	75	.IBMMO	1.30	0.04	-0.02	0.009	-0.001	23.57%
.IBMAP	7.40	5.76	0.85	0.043	-0.008	20.07%	80	.IBMMP	2.30	0.43	-0.15	0.043	-0.004	21.46%
.IBMAQ	4.10	2.36	0.54	0.073	-0.009	18.58%	85	.IBMMQ	4.10	1.99	-0.46	0.073	-0.005	20.07%
.IBMAR	2.05	0.65	0.22	0.054	-0.006	17.65%	90	.IBMMR	7.10	5.24	-0.78	0.054	-0.002	19.44%
.IBMAS	0.80	0.12	0.05	0.019	-0.002	17.06%	95	.IBMMS	10.40	9.67	-0.95	0.019	0.003	20.32%

Source:www.pcquote.com

The premia that one must pay for an IBM call price, an option to purchase stock, declines with the exercise price. As the exercise price rises, there is less of a chance that the stock price will exceed the exercise price and have intrinsic value.

Exercise Price	Premium
$75	$10.11
80	5.40
85	1.30
90	0.10
95	0.05

Note that if the common stock price rose to $90 by September 2004 one purchased a call option to purchase IBM at a $75 exercise price, for $10.11, then one could earn a larger return than buying the stock. If the price of IBM rises to $90, then the call option must be worth at least its intrinsic value, or $15.00. The rate of return for the call option is at least 48.37 percent.

$$R_t \geq \frac{\$90 - \$75 - 10.11}{10.11} = .4837$$

or 48.37%

The common stockholder return was 6.25 percent for the similar price movement – options offer investors the advantage of leverage. One may deal in the movement of a $84.71 stock with lower costs by purchasing a call option. However, one may also lose a large portion of the amount at risk by dealing in options. If the price of IBM falls to $70, then the call option has zero value, and the rate of return on the call option is -100 percent, whereas the common stockholder lost only 17.37 percent. The common stockholder suffered losses of $1471 [shown as 100 X ($84.71 - $70.00)], whereas the call option purchaser lost $1011 [the 100 X - $10.11] plus broker commission. However there is a limited loss on a call option; one may lose all of your premium, but no more. A call option on a stock whose stock price exceeds its exercise price is referred to as an "in the money" (ITM) option. The intrinsic value of an ITM option is positive, and one profits dollar for dollar on the call option as the stock price rises.

Note that if an investor was “bullish” on IBM, then one might prefer to purchase a call option whose exercise price is \$85 approximately the same price as the stock price. One can purchase this option, known as an “at the money” (ATM) call option, for a premium of \$1.30. If the price of IBM rises to \$90, then the ATM call option return is at least 284.62 percent.

$$R = \frac{\$90 - \$85 - \$1.30}{1.30} = 1.3255$$

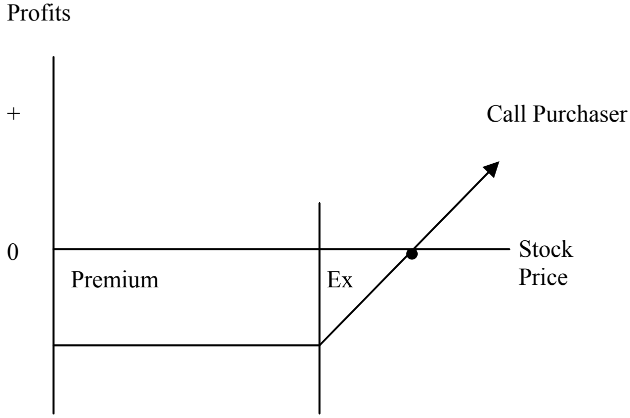
If the price of IBM falls to \$80, the call option purchaser loses \$130 (100), or \$130. The leverage advantage is larger for an ATM option than an ITM option. The ultimate bullish investor, one who sincerely wants to be rich, buys call options whose stock prices are less than the exercise prices. In 2004 in the IBM example, if one buys a September call option with a \$90 exercise price, then one pays a premium of \$0.10 or \$10 for the option. The intrinsic value for such an option is zero. The option has value only because there is an expectation that the stock price may exceed the exercise price by September 2004. There is a time component to options in which there is time for the stock price to rise and exceed the exercise price, producing a future positive intrinsic value. If IBM rises to \$92, then the \$90 exercise price call option buyer realizes a rate of return of at least 1900.00 percent for the month.

$$R_t = \frac{92 - 90 - .10}{.10} = 19.0000$$

Obviously, such a rapid rise of IBM is very unlikely. A call option whose stock price is less than the exercise price is referred to as an “out of the money” (OTM) option. The call option premium for an ITM option exceeds the premium of corresponding ATM or OTM options. For call option buyers, OTM offer the greatest leverage. The reader will note that the rate of return for a \$90 exercise price exceeds that of the \$85 exercise price, if the stock price rises.

A bullish investor who purchases OTM options also runs the chance that the options will expire useless. Thus, one sees a return and risk trade-off of call options in terms of deciding upon the exercise price. One can draw a graph to illustrate call option buying strategies.

One profits by purchasing call options as stock prices rise to exceed the exercise price and the premium paid for the option.



Why would one write or sell a call option? If an investor owns the stock, and expects no significant appreciation in the near future, then one can write call options to provide additional income or returns. That is, the investor would receive the premiums. In the case of the previously examined IBM call options, one can write a September 2004 option and receive $1.50. If IBM's stock price is still about $85.00 at the expiration of the November option, then the call writer keeps the premium and the call buyer's option expires without value. The call writer receives a $0.15 premium for writing the $90 exercise or strike price option, and all stock price appreciation above $90 is "traded away" for a $0.15 premium. In essence the investor who owns the underlying stock and writes calls on the stock, is known as a covered call writer and all gains above the exercise price is called away for the premium. As the call writer writes OTM options with exercise price that are rising, then the covered call writer returns approximate owning (long) the stock returns. The portfolio manager or writer of this covered call clearly expects the price of IBM to be at or below $90 by the last week of September. The writing of covered calls by portfolio holders can be very profitable.

An investor who buys a put option buys the right to sell the stock. The put option has a specified strike or exercise price for a stated time period, just as does the call option. The put option is of interest to an investor who expects the stock price to decline. For example, if an investor buys a \$85 put on IBM, then the investor is paying \$1.50 to sell IBM at 85. If the price of IBM falls \$70, then the intrinsic value of the put is \$15 and there will be additional premium for time. If the price of IBM falls to \$50, then the put option has at least \$35 of intrinsic value. An investor who expects the common stock of a firm to fall may either buy a put, or sell the stock short. An investor who writes or sells a put expects the stock not to fall, and receive the premium.

Let us introduce the notation of Malkiel and Quandt that is very useful to address combinations of put and call strategies. The Malkiel-Quandt notation is a bit dated, but in the opinion of the authors, a very useful means to describe the basic premises of buying and writing puts, calls, and straddles, combinations of a call and a put. We will later in the chapter introduce the reader to the binomial options pricing model, the current means of illustrating the pricing structure of calls and puts.

1. THE MALKIEL-QUANDT NOTATION

The authors have long admired the options notation put forth by Malkiel and Quandt (1969) in their very enjoyable and stimulating monograph on options markets. One profits from a stock price rise when one purchases a call option and loses only the premium from a stock price decline. As Malkiel and Quandt write, the option profits lose in terms of stock price advances and declines in a 2 x 1 matrix.

$$\begin{bmatrix} Pcs\uparrow \\ \hline Pcs\downarrow \end{bmatrix}$$

If one purchases a call option one profits as the stock price advances, and the Malkiel-Quandt notation would be:

$$\begin{bmatrix} +1 \\ 0 \end{bmatrix}$$

Note that the premiums are not included in the analysis and one must be careful in examining option/portfolio strategies. There may be a problem with naked call writing where the writer does not own the underlying stock, and where one loses in the event of a stock price advance in terms of unlimited stock advances and retains only the call premium in the event of a price decline:

$$\begin{bmatrix} -1 \\ 0 \end{bmatrix}$$

However, if one is a covered call writer, the Malkiel-Quandt notation is:

$$\begin{array}{c} \text{Covered} \\ \text{Call} \end{array} = \begin{array}{c} \text{long in} \\ \text{stock} \end{array} + \begin{array}{c} \text{call} \\ \text{writer} \end{array}$$

$$\text{writer} = \begin{bmatrix} +1 \\ -1 \end{bmatrix} + \begin{bmatrix} -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ -1 \end{bmatrix}$$

It would appear that the covered call writer never wins; however, if one writes a call option with an exercise price in excess of the stock price, (OTM), one can substantially profit on the stock price advance and receive a call premium to partially offset the stock price decline.

A put buyer return pattern can be written as:

$$\begin{bmatrix} 0 \\ +1 \end{bmatrix}$$

and a put writer return pattern is:

$$\begin{bmatrix} 0 \\ -1 \end{bmatrix}$$

The Malkiel-Quandt notation allows the reader to understand the basic concepts of buying and writing calls and puts.[1]

It should be obvious to the reader that an investor in IBM stock must have some expectations of future appreciation. Let us assume that IBM stock may rise 20% in the next period from its current price of \$55.00, or fall 10%. Let us consider a three-period analysis of possible prices. The possible prices can be determined by the binominal probability distribution.

Table 2. IBM Stock Price Example

t=0 (current)	t=1	t=2	t=3
			146.38
		121.98	109.78
			109.78
	101.65	91.49	82.34
			109.78
		91.49	82.34
$84.71			82.34
	76.24	68.62	61.76

The expected IBM prices are shown in Table 2 for our three-period analysis.

2. THE BINOMINAL OPTION PRICING MODEL

The binominal option pricing model (OPM) evolved from Sharpe (1978), Rendleman and Bartter (1979), and Cox, Ross, and Rubinstein (1979). Much easier than the Black and Scholes OPM derivation (the limiting case of the binominal OPM is its continuous time partner, the traditional Black and Scholes OPM) the binomial OPM may be developed from a very practical example. Let us assume that the firm's current stock price is P_{cs} and either goes up *u* in the next period or falls by *d.* A call option is equal to the maximum of zero or P_{cs} – Ex where Ex is the exercise price. In the King' s English, a call option cannot be negative. In a three-period model, the value of the call option, V_c, may be developed:

t = 0	t = 1	t = 2	t = 3
			$P_{cs}(u)^3$ – Ex
		$P_{cs}(u)^2$ – Ex	$P_{cs}(u^2d)$ – Ex
	$P_{cs}(u)$ – Ex		$P_{cs}(udu)$ – Ex
P_{cs} – Ex		$P_{cs}(ud)$ – Ex	$P_{cs}(udd)$ – Ex
			$P_{cs}(duu)$ – Ex
		$P_{cs}(du)$ – Ex	$P_{cs}(duu)$ – Ex
	$P_{cs}(d)$ – Ex		$P_{cs}(dud)$ – Ex
		$P_{cs}(d)^2$ – Ex	$P_{cs}(ddu)$ – Ex
			$P_{cs}(d)^3$ – Ex

The value of the call option can be found by multiplying the discounted value of the call in each of the eight possible states of nature by the respective probabilities of these states. The probability of an upward price movement, *u*, is *p*:

$$p = \frac{r-d}{u-d} \quad ,$$

where *r* is one plus the risk-free rate. The probability of a downward movement, *d*, is *q* where *q* = 1 = *p*. Thus the value of the call option:

$$V_c = \frac{p^3[P_{cs}(u^3)-Ex]+3p^2q[P_{cs}(u^2d)-Ex]+3pq^2[P_{cs}(ud^2)-Ex]+q^3[P_{cs}(d^3)-Ex]}{(1+r)^3} \quad (1)$$

This equation may seem rather formidable until one remembers that the reader solved this in sophomore statistics class. If *k* represents the number of upward movements in *n* periods:

$$V_c = \frac{1}{r^n}\sum_{k=0}^{n}\frac{k!}{(n-k)!}p^k q^{(n-k)}[\max(0, P_{cs}u^k p^{(n-k)} - Ex] \tag{2}$$

Let us work a very small numerical example that will illustrate the analysis. Assume the following:

P_{cs} = \$84.71
Ex = \$85.00
r = 1.2
d = .9
r = 1.02
$p = \frac{1.02 - .9}{1.2 - .9} \quad \frac{.12}{.30} = .40$

$$V_c = \frac{1}{(1.02)^3} \{(.4)^3[\max(0,84.71(1.2)^3 - 85]$$
$$+ 3(.4)^2(.6)[\max(0,84.71(1.2)^2(.9) - 85]$$
$$+ 3(.4)(.6)^2[\max(0,84.71(1.2)(.9^2) - 85]$$
$$+ (.4)^3[\max(0,84.71(.9^3) - 85]\}$$

$V_c =$ .942[.064(61.38) + .288(24.79) + .432(0) + .216(0)]
$V_c =$ .942(3.93 + 7.14)
V_c = \$10.42

The value of the three-period call is \$10.42. The call option, if only two-period, would be:

$$V_c = (1.02)^2\{[(.4)^2(84.71(1.2)^2 - 85) + 2(.4)(.6)[\max(0,84.71(1.2)(.9) - 85)] + (.6)^2[\max(0,84.71(.9)^2 - 85]\}$$

V_c = (.961)[.16(36.98) + .48(6.49) + (.36)(0.00)] = .961(5.92 + 3.12) = \$8.68

Note, as in the general case of options, as the time to maturity rises, the value of the option increases. The binominal option pricing model convergences to the traditional Black and Scholes Option Pricing Model as the number of periods go to infinity (continuous time), and the binominal approximation of the stock price distribution becomes normally distributed (for price relatives).

$$\log(P^*_{cs}/P_{cs}) = k \log(u/d) + n \log d, \tag{3}$$
$$E[\log(P^*_{cs}/P_{cs}] = mn,$$

where * denotes the maturity date and *mn* is the expected mean of the series.

$$\text{Prob}\left[\frac{\log(P_{cs}^{*} / P_{cs}) - mn}{\sigma\sqrt{n}} < Z\right] = \text{N(Z)}$$

The traditional Black and Scholes OPM can be written from the binominal option pricing model as:

$$V_c = P_{cs}N(X) - Exr^{-t}N(X - \sigma\sqrt{t}\,) \qquad (4)$$

where

$$X = \frac{\log(P_{cs} / Exr^{-t})}{\sigma\sqrt{t}} + \frac{1}{2}\sigma\sqrt{t}$$

The reader may well remember that the binominal distribution converges to the normal distribution with approximately 30 periods (the Central Limit Theorem).

3. THE MORE TRADITIONAL BLACK AND SCHOLES OPTION PRICING MODEL DERIVATION

The rudiments of the Black and Scholes OPM were known in the 1960s as shown in the works of Sprenkle (1962), Boness (1964), and Kassouf (1969); however, Black and Scholes (1973), developed their model with a hedge ratio that allowed not only a theoretical value but a risk-free hedging strategy.[2] The Black and Scholes OPM is characterized by rather restrictive assumptions: (1) the stock price series follows a lognormal distribution; that is, the distribution of price relatives is normally distributed; (2) the risk-free is constant; (3) the variance of the price series is constant and known; (4) the stock pays no dividend; and (5) the call option is a European call option that cannot be exercised prior to expiration (maturity).

The traditional Black and Scholes (1973) Option Pricing Model (OPM) finds a theoretical value of the call option, V_c, by creating a risk-free portfolio composed of a call option and shares of the underlying stock. The value of the portfolio, V_p, is found by the sum of the market values of equity and options.

$$V_p = hnV_c + mP_{cs} \qquad (5)$$

where

h = hedge ratio,
n = number of call options,
m = number of shares of stock,
and P_{cs} = price of common stock.

If there are no transactions in the stock and options, n and m are assumed to be constant, and the value of the portfolio may change as a result of fluctuating stock prices and call option prices. The reader is aware that changes in the stock price affect the price of call, however, the call price is affected by changes in the time to maturity of the option. Although the price of the underlying stock may be unchanged for a trading day, the value of the call will fall as a result of time decay. Without time decay, the change in the portfolio is:

$$dV_p = hndP_{cs} + mdV_c \tag{6}$$

If *n* and *m* are selected in this way, the risk free hedge is created:

$$dV_p = hdP_{cs} - dV_c \tag{7}$$

One notices that if the call option is written ($m < 0$), then the stock is purchased ($n > 0$) to create the hedged portfolios. The stock price and option price changes are:

$$dP_{cs} = P_{cs_{t+dt}} - P_{cs_t},$$
$$dV_{c'} = V_{c_{t+dt}} - V_{c_t}.$$

The change in the stock price series follows a random walk, that is, the stock price series follows a lognormal distribution and the distribution of price relatives. In ($P_{cs_t} /- P_{cs_{t-1}}$) is normally distributed. Black and Scholes (1973) and Smith (1976) write the change in the value of the call option may be written in terms of changes in time and the stock price.

$$dV_c = \frac{\partial V_c}{\partial t}dt + \frac{\partial V_c}{\partial P_{cs}}dP_{cs} + \frac{1}{2}\frac{\partial^2 V_c}{\partial P_{cs^2}}P_{cs}{}^2\sigma^2 \tag{8}$$

where

σ^2 = variance in stock price relatives.

The change in the value of the hedged portfolio is:

$$dV_p = hdP_{cs} - \left(\frac{\partial V_c}{\partial t} + \frac{1}{2} \frac{\partial^2 V_{c_2}}{\partial P_{cs}} \sigma^2 P_{cs}^2 \right) dt \tag{9}$$

The change in the value of the hedged portfolio should equal the risk-free rate, R_F.

$$R_F V_p = R_F P_{cs} \frac{\partial V_c}{\partial P_{cs}} + \frac{\partial V_c}{\partial^t} + \frac{1}{2} \frac{\partial^2 V_c}{\partial P_{cs^2}} \sigma^2 P_{cs}^2$$

$$0 = R_F P_{cs} \frac{\partial V_c}{\partial P_{cs}} + \frac{\partial V_c}{\partial^t} + \frac{1}{2} \frac{\partial^2 V_{c_2}}{\partial P_{cs}} \sigma^2 P_{cs}^2 - R_F V_P$$

The value of the V_c is found by solving the above partial differential equation subject to:

$V_c = \max(P_{cs} - Ex, 0)$, $0 < t < T$ (maturity date), $0 < P_{cs}$.

The Black and Scholes OPM value of the call option is found to be:

$$V_c = P_{cs}N(d_1) - \frac{Ex}{e^{rt}} N(d_2) \tag{10}$$

where

$$d_1 = \frac{\ln(P_{cs} / Ex) + (r + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}},$$

$$d_2 = \frac{\ln(P_{cs} / Ex) + (r - \frac{\sigma^2}{2})t}{\sigma\sqrt{t}},$$

N(.) = cumulative normal distribution, and $e = 2.71828$.

The optimal hedge ratio, h, to create the risk-free hedge is $N(d_1)$. If the call option is purchased, $N(d_1)$ shares of stock are sold short. If the call is over-valued and written, the stock is purchased in the ratio of $N(d_1)$. The traditional Black and Scholes OPM assumes that no dividends are paid. The dividends may be handled in several manners: (1) the present value of the escrowed dividend may be subtracted from the stock price; and (2) the time to ex-dividend is substituted for the same variable and the relevant stock price is the price less the present value of the escrowed dividends

$$0 = \frac{1}{2} \frac{\partial^2 V_{c_2}}{\partial P_{cs}} \sigma^2 P_{cs}^2 + \frac{\partial V_c}{\partial^t} + (R_F - D) P_{cs} \frac{\partial V_c}{\partial P_{cs}} R_F V_c \tag{11}$$

The value of the call option is clearly a function of six variables.

$$V_c = F\overset{+\quad +\quad +\quad +\quad -\quad -}{(P_{cs}, t, R_F, \sigma^2, D, Ex)}$$

As the stock price rises, the value of the call increases. This is immediately clear for an "in the money" call in which the stock price exceeds the exercise price. An increase in the exercise price reduces the value of the call. An increase in the time to maturity creates more time for the stock price to exceed the exercise price and thus raise the value of the option. The risk-free rate is used to discount the exercise price in determining the value of the call; an increase in the risk-free rate reduces the present value of the exercise price and increases the value of the call option. The dividend reduces the ex-dividend price and reduces the call. The variance of the price relative series positively affects the value of the call because an increase in the variability serves the probability that stock price will exceed the exercise price and raise the value of the call option.

The reader should be aware of the options tab of the *www.pcquote.com* website. An investor can access real-time option prices and calculated Black and Scholes implied option volatilities. Let us show an example of an October IBM call option with an exercise price of \$85, priced on August 25, 2004. The option expires in 2 months, or .167 years. The stock price of IBM was \$84.71, and the 3-month Treasury bill, the risk-free rate, was 1.4 percent. The historic volatility was 10.05% (the standard deviation). The last traded call was priced at \$2.15. Is this a fair value of the call option?

4. BLACK AND SCHOLES MODEL CALCULATION

The calculated Black and Scholes Option Pricing Model value of the October 2004 call with an exercise price of 85 is:

$$V_c = N(d_1)P_{cs} - \frac{Ex}{ert}N(d_2)$$

where

$$d_1 = \frac{\ln\frac{P_{cs}}{Ex} + (r + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}}$$

$$d_1 = \frac{\ln\left(\frac{84.71}{85}\right) + \left(.014 + \frac{(.1005)^2}{2}\right).167}{.1005\sqrt{.167}}$$

$$= \frac{-.0034 + .0032}{.041} = -.005$$

$$N(d_1) = .496$$

$$d_2 = \frac{\ln\left(\frac{P_{cs}}{Ex}\right) + \left(r - \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$d_2 = \frac{\ln\left(\frac{84.71}{85}\right) + \left(.014 - \frac{(.1005)^2}{2}\right).167}{.1005\sqrt{.167}}$$

$$= \frac{-.0034 + .0015}{.041} = -.046$$

$$N(d_2) = .480$$

The cumulative normal distribution, found in standard "area under the normal curve" statistical tables, produces cumulative areas of 49.6 and 48.0 percent, respectively, for d_1 and d_2.

$$V_c = \$84.71\ (.496) - \frac{\$85}{2.71828^{(.014)(.167)}}(.480)$$

$$V_c = \$42.02 - \$40.70 = \$1.32$$

The calculated Black and Scholes OPM value of \$1.32 exceeds last traded price of \$2.15. One should (sell) write the IBM call option. One could write the call option at \$2.15, buy 48.0 shares of IBM stock to hedge [$N(d_1)$ is the hedge ratio), and earn an excess return of 38.6 percent. The price on the call option should fall 38.6%. The excess return is calculated:

$$\frac{\$-2.15+1.32}{-\$2.15}=-38.6\%.$$

The put option price is developed from the put-call parity relationship in which the purchase of a put is equal to the price of the call plus the present value of the strike price less the stock price. That is, the purchase of a put is analogous to the purchase of a call, shorting the stock, and borrowing the discounted exercise price.

$$V_c - P_{cs} - V_P + \frac{Ex}{1+R_F} = 0$$

$$V_P - V_c + \frac{Ex}{1+R_F} - P_{cs}$$

The empirical results of Klemkosky and Resnick (1979) and Gould and Galai (1974) substantiate the put-call parity theory and options market efficiency [Galai (1977) and Phillips and Smith (1980)]. One may wonder why options trading firms have emerged in options analysis. One can easily find and agree upon the stock price, exercise price, risk-free rate, time to maturity, and dividends. The relevant variance to be used in pricing the option is of great concern and interest as is the role that options and stocks play in diversified portfolio. Latane and Rendleman (1976) found that if one assumes that the call option is correctly priced and solves the Black and Scholes OPM for the implied variance, the implied variances were superior to historic variances if forecasting future variances. Schmalensee and Trippi (1978) found that variances are not constant but are first-order negatively serially correlated, i.e., mean- reverting. In one of the best studies of options market efficiency, Whaley (1982) found: (1) the American call and European call options less the escrowed present values of dividends produced values within 3-5 cents of observed values (far within transactions costs, bid-ask spread) with goodness of fit measures exceeding 0.98. Furthermore, the option pricing errors are due to variance errors and not to dividends, time to maturity (particularly the American call option), or the "in the moneyness" of the call option. Whaley noted the conclusion about the in the money nature of option problems. Whaley's option regression results indicated a tendency for "out of the money" (P_{cs} < Ex) to be underpriced by the traditional Black and Scholes models at the 10 percent level (although the regression coefficient = .04 – .10). Black (1976) noted that out of the money options tended to be underpriced. Most options theorists agree that implied variances are relevant variance for options investing and these variances are not constant but rather mean-reverting.

The two major topics of option analysis concern the area of option portfolios and portfolio insurance. Merton, Scholes, and Gladstein (1978, 1982) developed portfolio models to analyze option portfolios. In their earlier price, Merton, Scholes, and Gladstein found using an option simulation period from June 1963 to December 1975, that "in the money" covered calls (P_{cs} > Ex) earned less return than merely owning the stock. This is hardly surprising because further stock price appreciation above the exercise price (above the current option premium) is called away by the option buyer. The "out of the money" covered calls earned higher returns than the "in the money" covered calls, but were still less than stock returns. The right tail of the stock price distribution is eliminated by writing calls on the held stock. Although covered call writing reduced returns relative to holding stock, the portfolio standard deviations also were lower involving call writers. The principal contribution of the Merton, Scholes, and Gladstein (1978) call option study was that portfolios composed of 90 percent commercial paper and 10 percent purchased out of the money calls outperformed stock returns, also producing much higher portfolio variances. The out of the money calls produced tremendous returns, despite the fact that 70 percent of the options expired unused, earning approximately 400 percent. One notes that out of the money option premiums, when the exercise price is 1.2 times the stock price (ie., Ex = 96, P_{cs} = 80), should be very small. Therefore, if the stock price raises slightly over the exercise price, the corresponding percentage option returns would be very large.

The Merton, Scholes, and Gladstein (1982) put study found that in the money puts (Ex > P_{cs}) provided portfolio insurance that was too costly for investors (reducing portfolio returns) whereas out of the money puts (Ex < P_{cs}) offered downside protection (protective puts) at a very reasonable (.4 percent) cost to the portfolio manager. Writing uncovered puts was far less variable than fully covered call writing, although both strategies had identical Malkiel-Quandt notation; the stock variance led to the higher variability in covered call writing. If one combines protective put purchases with out of the money call writing one could effectively shape the desired portfolio distribution. Bookstaber and Clarke (1983) developed a portfolio algorithm to set exercise price levels for puts and calls to manage an options portfolio (with as few as five options). The existence of the options markets should not influence the firm's stock price and cost of capital. Stock prices are determined by discounted expected earnings. Option prices are determined by stock prices and stock volatilities.

5. THE OPM AND CORPORATE LIABILITIES

Black and Scholes (1973) derived an economic value of the European call option, assuming no taxes or transactions costs, log-normally distributed stock prices, and a known and constant risk-free rate:

$$W = XN(d_1) - Ce^{-r}fN(d_2), \tag{12}$$

where

W = Price of the call;
X = Current value of the underlying asset, the stock price;
C = Exercise price of the call option;
t = Time to maturity;
r_f= Instantaneous risk-free rate;
N(…) = Standardized normal cumulative probability density function;

$$d_1 = \frac{\ln\left(\frac{x}{c}\right) + \left(r_f + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}};$$

$d_2 = d_1 - \sigma^2$ = Instantaneous variance of V's returns.

The firm's equity can be viewed as a European call option in which stockholders sell the firm to the bondholders with an option to buy back the firm at time period t. The exercise price is the face value of the debt. The equity will have a positive value only if the terminal value of the firm exceeds the face value of the debt.[3] The face value of the debt can be though of as the "limited liability" of the equity; it is the protection against the depreciation of the firm's value below the face value of the debt.[4]

Merton (1974) used the Black and Scholes options model to price corporate liabilities where the value of equity, *f*, may be expressed

$$f = h_{(\overset{+}{V}, \overset{-}{B}, \overset{+}{r_f}, \overset{+}{\sigma^2}, \overset{+}{t})}.$$

The value of equity increases with the value of the firm, the risk-free rate, the variance, and the time to maturity of the debt. The Equation for the value of equity can be written

$$\text{dist. 1} = \frac{\ln\left(\frac{V}{B}\right) + \left(r_f + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$\text{dist. 2} = \text{d}_1 - \sigma\sqrt{t}\ ;$$

$$f = \text{V[N(d}_1\text{)]} - \text{Be}^{-r_f t}\text{[N(d}_2\text{)]}.$$

Assume that a firm has a current market value of $5 million and that the face value of its debt is $2 million. The firm's variance of return is 10 percent and the risk-free rate is 5 percent. The firm's debt will mature in 20 years. The market values of its debt and equity can be found:

$$\text{dist.1} = \frac{\ln\left(\frac{5{,}000{,}000}{2{,}000{,}000}\right) + \left(.05 + \frac{.10}{2}\right)20}{\sqrt{.10}\left(\sqrt{20}\right)}$$

$$= \frac{.9163 + 2.000}{.3162(4.4721)}$$

$$= 2.0623.$$

From the table of areas under the normal curve,

$$\text{N(d}_2\text{)} = .2422 + .5000 = .7422.$$

The .5000 representing the area under the left-hand side of the normal curve is added as the cumulative normal function is employed. To find the value of equity,

$$S = \$5{,}000{,}000(.9803) - \$2{,}000{,}000(.7422)e^{-(.05)20}$$
$$= \$4{,}901{,}500 - \$546{,}080.24$$
$$= \$4{,}355{,}419.76$$

The market value of the firm's equity, from the options pricing model, is $4,355,419.76. Since its current market value is $5,000,000, the current market value of its debt must be $644,580.24. The market value of debt is the minimum of the value of the firm or the face value of debt.

If the firm engages in a merger that reduces its variance to 8 percent, the value of its debt will rise and the market value of its equity will decrease:

$$\text{dist.}1 = \frac{\ln\left(\frac{5{,}000{,}000}{2{,}000{,}000}\right) + \left(.05 + \frac{.08}{2}\right)20}{\sqrt{.08}\left(\sqrt{20}\right)}$$

$$= \frac{2.7163}{1.2647}$$

$$= 2.1478$$

N(dist. 1) = .9842

dist. 2 = 2.1478 - $\sqrt{.08}\left(\sqrt{20}\right)$

N(dist. 2) = .8106

The value of equity is found:

S = \$5,000,000 (.9842) – \$2,000,000 (.8106)$e^{-r_f t}$
= \$4,324,560.52

The value of equity has fallen from \$4,355,419.76 to \$4,324,560.52 entirely because of the reduction in the variance resulting from the merger. The value of the debt has risen:

\$5,000,000 – \$4,324,560.52 = \$675,439.48

Debt's value rises from \$644,580.24 to \$675,439.48 because of the reduction in the firm's variance.

If investors hold the market portfolio (equal amounts of the firm's debt and equity) a change in the market values of corporate liabilities will not affect the market values of their total holdings. The loss on equity holdings will be offset by the gain on debt holdings. If investors do not hold the market portfolio, wealth transfers from bondholders to stockholders must be made to leave stockholders indifferent to mergers. The merged firm will have a higher debt-to-equity ratio. Because interest on debt is deductible and the value of the firm rises with debt, the higher debt-to-equity ratio increases the value of the firm. The important aspect of this appendix is the stockholder – management relationships are discussed in Chapter 22.

Notes

[1]Straddles, straps, and strips, combinations of calls and puts, might pose problems for the Malkiel-Quandt notation. For example, if one purchases one call and one put at the same exercise price on the identical stock, it would appear that the investor will never lose.

$$\begin{matrix}\text{straddle} \\ \text{buyer}\end{matrix} = \begin{matrix}\text{call} \\ \text{buyer}\end{matrix} + \begin{matrix}\text{put} \\ \text{buyer}\end{matrix}$$

$$\begin{bmatrix}+1 \\ 0\end{bmatrix} + \begin{bmatrix}0 \\ +1\end{bmatrix} = \begin{bmatrix}+1 \\ +1\end{bmatrix}$$

One could purchase a 80 September call on IBM for \$5.10 and an 80 IBM September put for \$0.35. If the investor buys a straddle, one invests \$5.45 (or \$545 in the 100 share position) in the position. The investor purchases volatility in buying a straddle on profits only if the price rises above \$59.38 or falls below \$50.63. A straddle buyer does not care which event (advance or decline) occurs as long as the volatility is very large. A strike might lead one to buy a straddle on the firm's stock; one could profit on the put if the strike is long and violent and the call if the strike is settled quickly and cheaply. The Malkiel-Quandt positions do not offer the investor an insight into the volatility problems in purchasing a straddle. A straddle writer appears to consistently lose in the Malkiel-Quandt analysis:

$$\begin{bmatrix}-1 \\ 0\end{bmatrix} + \begin{bmatrix}0 \\ -1\end{bmatrix} = \begin{bmatrix}-1 \\ -1\end{bmatrix}$$

However, in reality, the writer wins as long as the price fluctuates between \$50.63 and \$59.38. The straddle writer wins as long as the stock volatility is low. Anything that reduces the stock volatility enhances the profitability of the straddle writer; for example a merger, particularly a conglomerate merger reduces systematic risk and total risk. A merger announcement could lend one to write straddles on the acquiring firm's stock.

A strap is when one has two calls and one put in an option portfolio. A strap buyer is not completely certain about the course of a stock's movement; however, the u=buyer is leaning toward an upward stock movement. One can easily see this in the Malkiel-Quandt notation:

$$\begin{matrix}\text{strip} \\ \text{buyer}\end{matrix} \quad 2\begin{bmatrix}+1 \\ 0\end{bmatrix} + \begin{bmatrix}0 \\ +1\end{bmatrix} = \begin{bmatrix}+2 \\ +1\end{bmatrix}$$

One must be aware of the numerous (3) transaction costs and premiums associated with straps. In our Alcoa example, the 55 October strap would cost \$737.50 [2(\$3) + \$1.375 = \$7.375]. Therefore, the break-even price range is \$47.63 and \$58.69 [\$55 + \$7.28/2]. One profits at a 2:1 ratio as the stock price advances above \$55. A strip is two puts and one call. A strip purchaser is somewhat confused but more pessimistic than optimistic about the stock price movement. The Malkiel-Quandt notation for a strip purchaser is:

$$\begin{matrix}\text{strip} \\ \text{purchaser}\end{matrix} \quad \begin{bmatrix}+1 \\ 0\end{bmatrix} + 2\begin{bmatrix}0 \\ +1\end{bmatrix} = \begin{bmatrix}+1 \\ +2\end{bmatrix}$$

Straddles, straps, and strips offer investors and portfolio managers opportunities to alter portfolio return distributions.

[2]Wall Street quickly adopted the Black and Scholes OPM to the extent that even practitioners into their 50's and 60's who cannot take a derivative, total or partial, have hired "computer jocks" to program the OPM into their computers or use their H-P calculators.

[3]The authors believe few stockholders view the call option feature as truly meaningful. If the market value of the firm falls below the value of debt, the stockholders' value is zero.

[4]The stockholders own the firm and agree to pay the bondholders the value of the firm until the value of the assets exceeds the face value of the debt. If the value of assets is less than the face value of debt, then the equity holders must declare bankruptcy, and the bondholders can take possession of the firm. When a firm uses leverage, then the risk of the firm increases and the return on equity rises (linearly). The beta of the firm rises with leverage as a linear function:

$$\beta_{jL} = \beta_{ju}[1 + \frac{D}{E}(1-t)]$$

where β_{jL} = firm j beta with leverage,
β_{ju} = firm j beta with leverage,
D = debt,
E = equity,
T = corporate tax rate.

The cost of equity is a linear function of the firm beta as the reader saw in Chapter 14 with the Capital Asset Pricing Model (CAPM):

$$Ke = R_F + \{E(R_M) - R_F]\ \beta$$

The beta in the CAPM is a levered beta for the vast majority of firms in our economy. The concept of options and leverage is important because equity is like a call option on the firm. Equity holders can undertake risky projects that may increase the volatility of the firm. The value of the call is a function of volatility, and higher risk increases the value of equity at the expense of debt.

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Problems

1. Go to *www.pcquote.com* and price a current, "at the money" Microsoft (MSFT) option.
2. Price GE call options with exercise prices of 40 and 45, respectively, given a current stock price of $34.67, three months to maturity of the options. And a relevant risk-free rate of 4.80%. If the call premium on the exercise pric of 40 is $5.80, should you purchase the call option? If the premium on the 45 GE call option is $11.10, should you purchase the option?

Chapter 17

REAL OPTIONS

Chapter 11 dealt with the capital budgeting process in which a financial manager accepts a project only if the discounted cash flow of that project exceeds the initial costs of the project. The discount rate is the cost of capital. The difference between the discounted cash flow and the initial cash outlay is the net present value, NPV, which should be positive to accept a project. This chapter discusses another application of cash flow and valuation, the application of real option theory, where the initial investment is the equivalent of the call price for the later project's return. Real option theory is especially applicable for investment in research and development.

The application of real option analysis can take several forms. First, one can examine the possible complications of the strict application of the NPV rule to an R&D investment decision, showing how stockholder wealth may be enhanced by the use of real options analysis. An investment project may be viewed as the right to pay an initial cash outlay, or cost, to receive the present value of the project's future cash flow. The second application of real options strategies is the case of abandonment valuation. When one calculates the value of a real option, one equates the investment cost of the project with the exercise price of the real option. The present value of the project is equivalent to the price of the underlying asset. Real options are an application of options theory to the operation and valuation of real investment projects [McDonald (2003)].

Research and development expenditures are capital expenditures involving discounting cash flow on future products or activity such that the net present value is positive. The research and development expenditures leading to the implementation of new technology is the call premium with the present value of the final project being the value of the call option. The R&D costs are the premium paid to acquire the future investment cash flow of the project resulting from the R&D activities. A pharmaceutical firm that engages in R&D expenditures may need to consider abandonment decisions and values. Additionally current R&D projects uncover options in future and expansive R&D projects. The R&D option is an option to expend the firm when it may not be obvious to management, at the current time, that primary financial decision is profitable. A current or static, negative net present value need not lead management to eliminate the

R&D project from its consideration. It is possible to reconsider the project at a later date when initial cash outlays of projects change, costs of capital change, higher estimates of future cash flows are different.

The traditional NPV capital budgeting criteria measures the profitability and acceptability of undertaking a project at the present time, and ignores the potential profitability of delaying the project until a later date. McDonald (2003) makes the point that the traditional, or static, NPV criteria assumes that the project will not be undertaken if it is rejected in the current period. The project cost can be thought of as an exercise price, and the present value of the project is the value of the underlying asset. If we delay the investment, we lose the cash flow of the project, very similar to a stock dividend not received. If the project cash flow are less than the interest saved by deferring the payment of the project investment, then it is efficient to wait to invest in the project.

1. THE OPTION TO DELAY A PROJECT

Projects are traditionally analyzed using the expected cash flows and discount rates at the time of the analysis; the net present value computed on that basis is a measure of its value at that time. Expected cash flows and discount rates may change over time, however, and then so will the net present value. Information may change over time and the option to wait, or delay a project, may have value. Thus, if expected cash flow rise or the discount rate falls, a project that has a negative net present value now may have a positive net present value in the future. In a competitive market, in which individual firms have no special advantages over their competitors in undertaking projects, this may not seem significant. However, in an environment in which only one firm, such as a firm with a patent, can take a project or barriers to entry, extensive advertising or other frictions prevail to create a change in the project's value over time to give it the characteristics of a call option.

In the abstract, assume that a project requires an initial investment, as the R&D program, C. The present value of expected cash inflows computed right now is PVCF. The net present value of this project is the difference between the two:

$$NPV = PVCF - C$$

Now assume that the firm has exclusive rights to this project for the next n years, and that the present value of the cash inflows may change over that time, because of changes in either the cash flows or the discount rate. Thus, the project may have a negative net present value right now, but it may still be a good project if the firm waits. Defining PVCF again as the present value of the cash flows, the firm's decision rule to accept the project should be if PVCF > C. If the firm does not take the project, it incurs no additional cash flows, though it will lose what it originally invested in the project. The price of the project, such as an R&D project, is the price of the call option. The exercise price of the call option is the cost of future investments needed when an initial investment is made. The project expected net present value is analogous to the price of stock in the Black and Scholes formulation. The underlying asset is the project, the strike price of the option is the investment needed to take the project; and the life of the option is the period for which the firm has rights to the project. The variance in this present value represents the variance of the underlying asset. The value of the option is largely derived from the variance in cash flows as the higher the variance, the higher the value of the project delay option. Thus, the value of an option to do a project in a stable business will be less than the value of one in a changing environment. Mitchell and Hamilton (1988) emphasize that management needs to identify strategic objectives, and review the impact of strategic options, such R&D projects directed toward strategic planning, and identify the strategic planning targets of future R&D projects.

2. IMPLICATIONS OF VIEWING THE RIGHT TO DELAY A PROJECT AS AN OPTION

Several interesting implications emerge from the analysis of the ability to delay a project as an option. First, a project may have an initial negative net present value based upon current expected cash flows, but it may still be a "valuable" project because of the option characteristics. Thus, while a negative net present value should encourage a firm to reject a project, it should not lead it to conclude that the rights to this project are worthless. Second, a project may have a positive net present value but still not be accepted right away. This is because the firm may gain by waiting and accepting the project in a future period, particularly for risky projects. In static analysis, increasing uncertainty increases the riskiness of the project and may make it less attractive. When the project is viewed as an option, an increase in uncertainty may actually make the option more valuable.

3. ABANDONMENT VALUE

A project does not always produce its expected cash flow and the net present value of a project, initially calculated to be positive, does not always produce value for the shareholders. How does management come to grips with cash flow forecasts that turn out to be incorrect or where based on assumptions that are not substantiated? What can the firm's financial managers do to minimize stockholders losses? A possible solution is abandonment of the project. The option to abandon a project may consist of selling the project's assets and not realizing future cash flow. The abandonment option is a put option, similar in logic to the put options on stocks discussed in Chapter 16.

Let us develop an investment scenario where abandonment value enhances the decision making process. An R&D project requires the construction of a new building near to, but off, the main corporate grounds. The new building will cost $45,000,000 and can house a small production facility for three years even if management decides to forego or postpone the R&D project. Sales of the production facility are dependent upon the state of the economy. The corporate economists have prepared a set of three-year cash flow forecasts that are first-year probabilities and second year conditional probabilities. That is, the cash flow forecasts are dependent upon particular states of nature occurring in years one and two. See Table 1. One should calculate the expected net present value of the projected cash flow, assuming a 10 percent cost of capital. The calculations

Table 1. Economic Scenarios of the Economy and Project Cash Flow

State of the Economy	Year 1 Probabilities	($mm) Cash Flow	Year 2 Probabilities	Cash Flow
Recession	.30	$20.0	.30	10
			.40	20
			.30	30
Normal	.30	30.0	.15	20
			.50	30
			.35	50
Boom	.40	50.0	.10	30
			.40	50
			.50	75

of the expected net present value and internal rate of return are shown in Table 2. One multiples the cash flow under the various economic scenario, depression, recession, normal, and boom, by the cash flow occurring in that state of the economy. The three scenarios, two-period analysis produces 9 possible states of the economy. The key to the analysis is to calculate the joint probabilities of each possible state. Each state of the economy is conditional upon the previous period's state of the economy. See Table 2 for the calculation of the joint probabilities, the expected present value, and the expected net present value.

The expected present value of cash flow is $65,560,000. Given the cost of the building of $45,000,000, the expected net present value of the new building is $20,560,000. The expected net present value exceeds zero and the new building can be justified at a cost of capital of 10 percent. The expected internal rates of return (IRR) of the project for the 9 scenarios are shown in Table 3. The expected internal rate of return is 34.84%, far exceeding the cost of capital, and the project is acceptable. The reader is referred to Chapter 11 in which we stated that in the vast majority of cases, a positive net present value implies that the internal rate of return exceeds the cost of capital.

Table 2. Expected Net Present Value ($ MM)

	Cash Flow		PVIF		Present Value				Expected
State of Nature	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Present Value	Joint Probability	Present Value
Recession	20	10	0.909	0.826	18.18	8.26	26.44	0.090	2.38
	20	20	0.909	0.826	18.18	16.52	34.70	0.120	4.16
	20	30	0.909	0.826	18.18	24.78	42.96	0.090	3.87
Normal	30	20	0.909	0.826	27.27	16.52	43.79	0.045	1.97
	30	30	0.909	0.826	27.27	24.78	52.05	0.150	7.81
	30	50	0.909	0.826	27.27	41.30	68.57	0.105	7.20
Boom	50	30	0.909	0.826	45.45	24.78	70.23	0.040	2.81
	50	50	0.909	0.826	45.45	41.30	86.75	0.160	13.88
	50	75	0.909	0.826	45.45	61.95	107.40	0.200	21.48
Expected Present Value									65.56
Expected Net Present Value									20.56

Table 3. Expected Internal Rate of Return

State of Nature	Internal Rate of Return	Joint Probability	E(IRR)
Recession	-25.66%	0.090	-2.31%
	-7.50	0.120	-.90
	6.84	0.090	0.62
Normal	7.87	0.045	0.35
	21.53	0.150	3.23
	43.89	0.105	4.61
Boom	33.33	0.040	1.33
	54.31	0.160	8.69
	96.10	0.200	19.22
Expected Internal Rate of Return			34.84%

The expected IRR for the project is 34.84 percent. The expected IRR exceeds the cost of capital, and hence the expected net present value is positive. The expected variance of the project is 14.94 percent; the calculations are shown in Table 4.

Table 4. Variance of Expected Internal Rate of Return

State of Nature	Joint Prob	IRR	E(IRR)	Std (IRR)
Recession	0.090	-0.2566	-0.0231	0.0329
	0.120	-0.0750	-0.0090	0.0215
	0.090	0.0684	0.0062	0.0071
Normal	0.045	0.0787	0.0035	0.0033
	0.150	0.2153	0.0323	0.0027
	0.105	0.4389	0.0461	0.0009
Boom	0.040	0.3333	0.0133	0.0000
	0.160	0.5431	0.0869	0.0061
	0.200	0.9610	0.1922	0.0751
			0.3484	0.1494

What is the economic benefit of being able to abandon the new building project after year one at an abandonment value of $24,000,000? If the abandonment value of $ 24.0 million exceeded the expected present value of cash flow of year two in any scenario or state of the economy, then the expected net present value calculation of the new building should be recalculated. The present value of the abandonment value of $ 24.0 million exceeds the expected present value of cash flow for year two in the recession ($16.52 million) mode. The abandonment value option increases the project net present value (NPV) to $ 67.15 MM, see Table 5, and the internal rate of return to 37.77%. The variance of the expected internal rate of return falls to 12.88% with abandonment value.

Table 5. Expected Net Present Value of Year Two States of Nature

State of Nature	Cash Flow Year 1	Year 2	Year 2	Year 2	Joint Probability	Present Value of Year 2
Recession	20	10	0.826	8.26	0.300	2.48
	20	20	0.826	16.52	0.400	6.61
	20	30	0.826	24.78	0.300	7.43
Recession Expected (PV)						16.52
Normal	30	20	0.826	16.52	0.100	1.65
	30	30	0.826	24.78	0.500	12.39
	30	50	0.826	41.30	0.350	14.46
Normal Expected (PV)						28.50
Boom	50	30	0.826	24.78	0.100	2.48
	50	50	0.826	41.30	0.400	16.52
	50	75	0.826	61.95	0.500	30.98
Boom Expected (PV)						49.97

The recalculated expected net present value of the new building is shown in Table 6. The expected net present value increases by $ 1.59 million by the presence of the abandonment option. The project should be abandoned after year one.

The presence of an abandonment value of $ 24.0 million enhances the net present value of the project by $ 1.59 million because the abandonment value exceeds the expected present value of year two cash flows in the recession scenario. The abandonment analysis may not be complete, until one calculates the present value of the cash flow foregone by abandoning the project. The present value of the abandoned cash flow is shown in Table 7, and is $ 33.74 million.

Table 6. Expected Net Present Value with Abandonment Value

State of Nature	Cash Flow Year 1	Year 2	PVIF Year 1	Year 2	Present Value Year 1	Year 2	Present Value	Joint Probability	Expected Present Value
Recession	44	0	0.909	0.826	40.00	0.00	40.00	0.090	3.60
	44	0	0.909	0.826	40.00	0.00	40.00	0.120	4.80
	44	0	0.909	0.826	40.00	0.00	40.00	0.090	3.60
Normal	30	20	0.909	0.826	27.27	16.52	43.79	0.045	1.97
	30	30	0.909	0.826	27.27	24.78	52.05	0.150	7.81
	30	50	0.909	0.826	27.27	41.30	68.57	0.105	7.20
Boom	50	30	0.909	0.826	45.45	24.78	70.23	0.040	2.81
	50	50	0.909	0.826	45.45	41.30	86.75	0.160	13.88
	50	75	0.909	0.826	45.45	61.95	107.40	0.200	21.48
Expected Present Value with Abandonment Value									67.15
Expected Net Present Value with Abandonment Value									22.15

Table 7. Expected Net Present Value of Year Two Cash Flow

State of Nature	Year 2	Year 2	PV(Year 2)	Joint Probability	Present Value of Year 2
Recession	10	0.826	8.26	0.090	0.74
	20	0.826	16.52	0.120	1.98
	30	0.826	24.78	0.090	2.23
Normal	20	0.826	16.52	0.045	0.74
	30	0.826	24.78	0.150	3.72
	50	0.826	41.30	0.105	4.34
Boom	30	0.826	24.78	0.040	0.99
	50	0.826	41.30	0.160	6.61
	75	0.826	61.95	0.200	12.39
Expected (PV) of Year 2 Cash Flow					33.74

This chapter follows Copeland and Weston (1992) and calculates the abandonment put value. One uses the present value of the abandoned cash flow as the equivalent of the stock price, the abandonment value as the exercise price, and a two-year period for the option. If the risk-free rate is 5 percent, the value of the put option is calculated to be $0.036 million.

$$v_c = P_{cs} N(d_1) - \frac{Ex}{e^{rt}} N(d_2)$$

$$d_1 = \frac{\ln\left(\frac{P_{cs}}{Ex}\right) + rt}{\sigma\sqrt{t}} + \frac{1}{2}\sigma\sqrt{t}$$

$$d_2 = d_1 = \sigma\sqrt{t}$$

$$d_1 = \frac{\ln\left(\frac{33.74}{24}\right) + .05\ (1)}{.1288\ \sqrt{1}}$$

$$+\frac{1}{2}(.1288)$$

$$= \frac{0.3406 + .05}{.1288(1)} + \frac{1}{2}(.1288)\ \sqrt{1}$$

$$= \frac{.3906}{.1288} + .0644 = 3.097$$

$$d_2 = 3.907 - .1288\sqrt{1} = 3.907 - .1288 = 2.968$$

$N(d_1) = 1.000$

$N(d_2) = 0.9986$

$$v_c = 33.74(1.000) - \frac{24}{2.71828 - .05(1)}\ (.9986)$$

$$= 33.74 - \frac{24}{1.051}\ (.9986)$$

$$= 33.74 - 22.80 = 10.94$$

$$v_{c_0} - P_0 = P_{cs} + \frac{Ex}{e^{rt}}$$

$$P_0 = 10.94 - 33.74 + \frac{24}{1.051}$$

= \$10.94 -33.74 + 22.84 = \$ .036

The value of the put option to abandon the project is worth \$ 0.036 MM.

4. OPTIONS IN INVESTMENT ANALYSIS/ CAPITAL BUDGETING

In traditional real investment analysis, a project or new investment should be accepted when the returns on the project exceed the hurdle rate (the cost of capital) so that the project shows a positive net present value. Real option analysis adds some additional consideration to the capital investment decision. The availability of the option to delay a project, especially when the firm has exclusive rights to the project. The second is the option to expand a project to cover new products or markets at some time in the future.

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Chapter 18

MERGERS AND ACQUISITIONS

A company can grow by taking over the assets or facilities of another firm. The various methods by which one firm obtains or "marries into" the business, assets, or facilities of another company are mergers, combinations, or acquisitions.[1] These terms are not used rigidly. In general, however, a merger signifies that one firm obtains another by issuing its stock in exchange for the shares belonging to owners of the acquired firm, or buys another firm with cash. Company X gives some of its shares to Company Y shareholders for the outstanding Y stock. When the transaction is complete, Company X owns Company Y because it has all (or almost all) of, the Y stock. Company Y's former stockholders are now stockholders in Company X. In a combination, a new corporation is formed from two or more companies who wish to combine. The shares of the new company are exchanged for those of the original companies. The difference between a combination and a merger lies more in legal distinctions than in any discernible differences in the economic or financial result. In practice, the terms merger or combination are often used interchangeably.

An acquisition usually refers to a transaction in which one firm buys the major assets or the controlling shares of another company. On occasion, one corporation has purchased another corporation's subsidiaries. An acquisition differs from a merger in that generally (but not always) cash is used rather than an exchange of securities.

A firm which either by the exchange of securities or purchase owns or controls subsidiary companies but does not engage in activities of its own is called a *holding* company. The holding company differs from a *parent* company in that the parent company has production functions of its own whereas a holding company exists *mainly* to control or coordinate its subsidiaries.

No new net financial holdings are created in the economy by any of the forms of merger or acquisition [Mossin (1973)]. If the transaction involves an exchange of stock, the supply of shares of one company's stock is eliminated and is replaced by the shares of the surviving company. If the transaction is financed by cash, cash holdings by individuals go up, but cash held by corporations goes down; the supply of outstanding securities in the hands of the public goes down, but the amount held by corporations rises. If a corporation floats new securities to obtain funds to finance its acquisition, the process is slightly roundabout, but the net results are the same. One section of the public surrenders its cash for new corporate securities; another group gives up a different issue of securities for cash.

1. NONECONOMIC MOTIVES FOR COMBINATIONS

Non-economic motives may dominate in a number of mergers; sociological or psychological motives, possibly involving the personal well-being of the management, may lie behind some combinations. Management may feel that its prestige, status, or salary will rise if it is in charge of a larger business (even though the *rate* of profit may be no higher than that of the present firm). Management may favor a merger because the acquiring firm has better bonus or retirement provisions than the present company. A merger or combination may take place because the management of one company is getting old and a merger may appear to be the simplest method of obtaining new managerial personnel. A wave of mergers or acquisitions may take place to satisfy the desires for risk of a speculative management.

Where an industry is characterized by oligopolistic competition, company growth, whether achieved by combination or direct investment, may be announced as being undertaken to "maintain the company's relative share of the market" or to "prevent deterioration of the company's competitive position." These announced reasons may appear to reflect desires to maintain corporate prestige or status. Actually they may have considerable economic validity as rule-of-thumb guides to prevent erosion of the earning power of the firm. As noted in Chapter 11, sometimes the return on a new investment may be computed not on the basis of potential additional earnings but on the basis of losses averted or on a prevented decrease in earnings. Thus growth can be defensive, a rational move to forestall a downward slide in the company's market position which, once started, may be difficult to halt.

By their nature the psychological and sociological motives underlying some instances of corporation growth are obscure and complex and do not allow for easy analysis or any reliable quantification. Since economic analysis rests on the supposition of economic rationality on the part of decision-makers, it cannot furnish much light on growth undertaken mainly to satisfy desires for status or power.

2. HOLDING COMPANIES

The use of the term "holding company" is not always clear in financial literature. In general, a holding company is a firm that owns controlling shares in other corporations and whose main function is to coordinate and direct the affairs of these subsidiaries. In contrast many operating companies run subsidiaries and yet are not usually referred to as holding companies, because they have extensive operations of their own.[2] The holding company must also be distinguished from the investment company, which holds shares in other corporations mainly for the investment return and does not guide their internal management.

Among the advantages of the holding company is flexibility of administration. It enables top management to centralize those functions which can be performed at lower costs in large volumes and to decentralize responsibility for programs and functions better performed or supervised at local levels. Of course, like other forms of organization, the holding company can become too large and thus inefficient in trying to coordinate its various enterprises.[3]

2.1 A Merger History of the US

The height of the merger movement was reached in 1901, when 785 plants combined to form America's first billion-dollar firm, the United States Steel Corporation. The series of mergers creating U.S. Steel allowed it to control 65 percent of the domestic blast furnace and finished steel output. This growth in concentration was typical of the first merger movement. The early mergers saw 78 of 92 large consolidations gain control of 50 percent of their total industry output, and 26 secure 80 percent or more.

The beginning of the major merger movement occurred during a period of rapid economic growth. The economic rationale for the large merger movement was the development of the modern corporation, with its limited liability, and the modem capital markets, which facilitated the consolidations through the absorption of the large security issues necessary to purchase firms. Nelson (1959) found the mergers were highly correlated with the period's stock prices (.613) and industrial production (.259) during the 1895-1904 period. The expansion of security issues allowed financiers the financial power necessary to induce independent firms to enter large consolidations. The rationale for the first merger movement was not that of trying to preserve profits despite slackening demand and greater competitive pressures. Nor was the merger movement the result of the development of the national railroad system, which reduced geographic isolation and transportation costs. The first merger movement ended the 1904 depression, with the *Northern Securities* case. Here it was held, for the first time, that antitrust laws could be used to attack mergers leading to market dominance.

A second major merger movement stirred the country from 1916 until the Depression of 1929. This merger movement was only briefly interrupted by the First World War and the recession of 1921 and 1922 Approximately 12,000 mergers of the period coincided with the stock market boom of the 1920s. Although mergers greatly affected the electric and gas utility industry, market structure was not as severely concentrated by the second movement as it had been by the first. Stigler (1950) concluded that mergers during this period created oligopolies, such as Bethlehem Steel and Continental Can. Mergers, primarily vertical and conglomerate in nature as opposed to the essentially horizontal mergers of the first movement, did affect competition adversely. The conglomerate product-line extensions of the 1920s were enhanced by the high cross-elasticities of demand for the merging companies' products (Lintner 1947). Antitrust laws, though not seriously enforced, prevented mergers from creating a single dominant firm. Merger activity diminished with the Depression of 1929 and continued to decline until the 1940s.

The third merger movement began in 1940; mergers reached a significant proportion of firms in 1946 and 1947. The merger action from 1940 to 1947, although involving 7.5 percent of all manufacturing and mining corporations and controlling 5 percent of the total assets of the firms in those industries, was quite small compared to the merger activities of the 1920s. The mergers of the 1940s included only one between companies with assets exceeding \$50 million and none between firms with assets surpassing \$100 million. The corresponding figures for the mergers of the 1920s were 14 and 8, respectively. Eleven firms acquired larger firms during the mergers of the 1920s than the largest firm acquired during the 1940s.

The mergers of the 1940s affected competition far less than did the two previous merger movements, with the exception of the food and textile industries. The acquisitions by the large firms during the 1940s rarely amounted to more than 7 percent of the acquiring firms' 1939 assets or to as much as a quarter of the acquiring firm's growth from 1940 to 1947. Approximately \$5 billion of assets were held by acquired or merged firms over the period 1940-1947. Smaller firms were generally acquired by larger firms. Companies with assets exceeding \$100 million acquired, on average, firms with assets of less than \$2 million. The larger firms tended to engage in a greater number of acquisitions than smaller firms. The acquisitions of the larger acquiring firms tended to involve more firms than did those of smaller acquiring firms. Mergers added relatively less to the existing size of the larger acquiring firms. The relatively smaller asset growth of the larger acquiring firms is in accordance with the third merger movement's generally small effects on competition and concentration.

The current merger movement is an extension of the 1940s conglomerate movement beginning in 1951 and continuing to the present. Conglomerate mergers involve two firms in different, uncorrelated businesses. Of the nine mergers occurring in 1951 involved acquired firms with assets exceeding $10 million, four were conglomerate mergers, of which three were product-line-extension combinations. The growth of the large conglomerate mergers continued throughout the forecast period. In 1954, 21 of the 37 mergers involving acquired firms with assets exceeding $10 million were conglomerate in nature; 14 of the 21 conglomerate mergers were product-line extensions, while only two of the mergers were market-extension combinations. The mergers of the 1960s, 1970s, and 1980s were almost purely conglomerate in nature.

3. USING AN ACCOUNTING BASIS

If one company purchases another company and only the acquiring company survives, the combination is a merger. A consolidation involves the combination of at least two firms in which a new firm is created.

A company acquires another firm by the *purchase* or accounting method when the acquired firm is valued as the amount actually purchased [Weston, Mitchell, and Mulherin (2004)]. The parent firm records the acquired assets at their current market value. If the current value of the acquired firm exceeds its book value, the excess is goodwill that will be amortized over a period of no more than 40 years. The purchase method is the sole acceptable method of accounting for mergers and acquisitions since the Financial Accounting Standards Board (FASB) voted in January 2001 to eliminate the pooling-of-interests method of accounting for mergers and acquisitions.

A second accounting practice, the *pooling-of-interests* method, is no longer allowed since the FASB released its "Business Combinations" statement (No. 141) in June 2001, had allowed acquisitions in which interests of both firms' stockholders are merged. No assets are revalued and no goodwill was recognized as assets in pooling of interests mergers, and liabilities of the new firms were recorded as such on the unmerged firms' books. The pooling-of-interests method may be used only when one firm issues voting stock for the acquisition; no cash transactions are allowed. The stock issuance for the acquisition must be a single transaction, and the acquiring firm must acquire at least 90% of the acquired firm's stock. The FASB No. 141 Statement superseded the Accounting Principles Board (APB) Opinion 16, "Accounting for Business Combinations" of August 1970, which allowed both purchase and pooling-of-interests methods of accounting for mergers and acquisitions.

In the purchase method of accounting for a merger or acquisition, the purchase price is the basis for recording the assets and liabilities of the acquired firm. The earnings of the acquired firm are reported by the acquiring firm from the date of the acquisition forward. In the pooling-of-interests method of accounting, the original historic cost basis of the assets and liabilities of the acquired firm are carried forward and the earnings of the combined entity are combined for any reporting periods. Prior year earnings would be the earnings of the pooling-of-interest combination. Assets acquired in a pooling-of-interest M&A could be sold for a higher price than was recorded in the original transaction and gains in such a transaction would be earned income. The pooling-of-interests method had the potential to manipulate earnings of the firm [Weston, Mitchell, and Mulherin (2004)].

3.1 The Economic Basis for Acquisitions

There are three economic reasons for seeking to acquire other firms; to pursue profits through monopoly power, to generate economies of scale in operations, and to contribute managerial abilities lacking in the acquired firm's management. Expectations of the three economic benefits of mergers can explain horizontal mergers, in which a firm acquires a firm in its own industry. But economic reasons cannot explain the development of conglomerate mergers, in which a firm acquires a firm in an unrelated industry. Economists have held that mergers do not generally produce synergism, the "2 + 2 = 5" effect. When synergism is absent, the value f the mergers adhere to the additive property of value in which the value of the merged film is the sum of the market values of the unmerged firms (Mossin 1973):

$$MV_{ab} = MV_a + MV_b \tag{1}$$

where

MV_{ab} = market value of the merged firm, a and b;
MV_a = market value of firm a;
MV_b = market value of firm b.

If no synergism exists, there would not seem to be any economic rationale for conglomerate mergers.

4. THEORIES OF CONGLOMERATE MERGERS

Conglomerate mergers were explained by Mueller (1969) as resulting from firms' attempts to maximize growth. If a larger, more mature firm wants to consider the more profitable investment opportunities and the higher rates of return on projects of a smaller, younger firm, the larger firm might purchase the smaller firm. By purchasing the smaller firm, the larger firm has internalized the investment opportunities, and the more profitable marginal investment contributes to the larger firm's growth. Synergism, in which the merged firm's market value exceeds the sum of the unmerged firms' market values, would rarely be found in a conglomerate merger. Mueller hypothesized that the conglomerate merger could be justified only if the managers of the acquiring firm could find investment opportunities currently overlooked by the acquired firm's management. Mueller's theory of mergers has been questioned because its premise is that firms maximize growth. Corporate benefits tend to be distributed on the basis of profits, not growth of sales. Management would maximize profits, in a rational environment, if profits served solely as the basis for benefits.

Gort (1969) put forth a theory of mergers based on valuation discrepancies, or disturbances. Acquisitions of other firms occur when a higher value is placed on the firm's assets by the potential purchaser than by the current owners. Valuation discrepancies tend to occur in times of high stock prices, as purchasers tend to believe the rapid changes in stock prices represent an increased economic disturbance. The higher disturbance increases the distribution of the firm's assets' valuations, raising the probability that an investor will place a higher value on the firm than the current owners. The empirical evidence has revealed that mergers occur during periods of high stock prices; thus there could be a basis for Gort's disturbance theory.

One of the principal theories of conglomerate mergers is that mergers reduce the probability of bankruptcy for the merged firm. Lewellen (1971) advanced the theory that mergers reduce the variance of the merged firm's cash flow. Mergers may lessen in the possibility of default and increase the firm's debt capacity. Debt capacity is increased as lenders are willing to establish a higher corporate lending limit to the merged entity. However, the merger must involve firms with less than perfectly correlated income streams. The merging firms must not have cash flows such that defaults on their borrowings could occur simultaneously.

Assume that firms A and B are considering a merger. Given the following probability estimates of the possible states of the world, would the risk of default be lessened by the merger?

		Cash Flow	
Probability	State	Firm A	Firm B
0.2	Depression	$ 100	$920
0.3	Recession	300	700
0.4	Normal	700	240
0.1	Boom	1,000	0

It is obvious that the cash flows of firms A and B are negatively correlated. Firm A could be a venture capital firm that profits from a rising economy while firm B could be a gold mining company that profits when gold prices are high, the economy falling.

Firms A and B have the same expected values E(CF) and essentially the same standard deviations of cash flows, σ_{CF}. The expected cash flow is of the form

$$\sum_{i=1}^{4} p_i CF_i,$$

where p_i = probability of the occurrence of state of nature, I, and the variance is of the form

$$\sum_{i=1}^{4} [CF_i - E(CF)]^2 p_i. \tag{2}$$

We may calculate the expected values of the two cash flows, CF_A and CF_B.

.2($80)	=	$16	.2(920)	=	$184
.3($280)	=	84	.3(700)	=	210
.4($700)	=	280	.4(240)	=	96
.1($1,000)	=	100	.1(0)	=	0
$E(CF_A)$	=	490	$E(CF_B)$	=	490

And the variances:

.2($ 80 - $490)	=	$33,620
.3($ 280 - $490)	=	13,230
.4($ 700 - $490)	=	17,640
.1($1,100 - $490)	=	37,210
$Var(CF_A)$	=	$101,700
$\sigma(CF_A)$	=	$319

.2(\$920 - \$490)	=	\$36,980
.3(\$700 - \$490)	=	13,230
.4(\$240 - \$490)	=	25,000
.1(\$ 0 - \$490)	=	24,010
$Var(CF_B)$	=	\$99,200
$\sigma(CF_B)$	=	\$315

The covariance of A's and B's cash flows, the covariance being

$$\sum_{i=1}^{4} p_i [CF_{A_i} - E(CF_A)][E(CF_{B_i} - E(CF_B)], \tag{3}$$

is calculated:

.2(\$80 - \$490) (\$920 - \$490)	=	\$-35,260
.3(\$ 280 - \$490) (\$700 - \$490)	=	-13,230
.4(\$ 700 - \$490) (\$240 - \$490)	=	-21,800
.1(\$1,100 - \$490) (\$0 - \$490)	=	-29,890
$Cov(CF_A,CF_B)$	=	\$-99,380

The correlation coefficient, r, of the cash flows of firms A and B will establish that these are imperfectly correlated firms.

$$r = \frac{Cov(CF_A, CF_B)}{\sqrt{Var(CF_A \text{ x } Var(CF_B)}}$$

$$\frac{\$-99{,}380}{\sqrt{\$101{,}700 \text{ x } \$99{,}200}} = \frac{\$-99{,}380}{\$100{,}452} = -.989$$

The correlation coefficient of -.99 shows that the cash flows of firms A and B are almost perfectly negatively correlated.

If firms A and B are assumed to have assets of \$10,000 each, a debt of \$6,000 each, with each firm's debt having a 4 percent cost, the unmerged firms should have essentially the same default probability. The interest costs for each firm are \$240, that is, \$6,000(.04), and the probabilities of default, given by the area under the normal curve, are essentially equal. The general form is

$$Z = \frac{x - \mu}{\sigma} \tag{4}$$

where

Z = Standardized normal variable;
X = Interest cost, \$240;
μ = Expected value, \$490 of cash flow;
σ = Standard deviation of cash flow, \$319 and \$315 for firms A and B, respectively.

P_r (Firm A's cash flow > \$240)

$$Z_A = \frac{\$240 - \$490}{\$319} = -.784$$

$$Z_B = \frac{\$240 - \$490}{\$315} = -.794$$

The Z-Values of -.784 and -.794 correspond to bankruptcy probabilities of .2187 and .2175 for firms A and B, respectively. The Z-value of -.78 indicates an area under the normal curve such that there is a .2923 probability that the outcome cash flow will fall between \$240 and \$490. There is a probability of .5000 that the cash flow will exceed \$490. Summing up these probabilities gives .7823, the probability that firm A's cash flow will exceed \$240. Thus (1 - .7823) = .2187, the probability of firm A's cash flow falling below its interest obligations and bankruptcy ensuing.

The merger of firms A and B yields a cash flow of:

Probability	State	(M) Merged Firm's Cash Flow
.2	Depression	\$1,020
.3	Recession	1,000
.4	Normal	940
.1	Boom	1,000

The expected value and the variance of the cash flow may be calculated:

.2(\$1,020)	=	\$204
.3(\$1,000)	=	300
.4(\$490)	=	376
.1(\$1,000)	=	100
$E(CF_M)$	=	\$980

.2($1,020 - $980)	=	$320
.3($1,000 - $980)	=	120
.4($940 - $980)	=	640
.1($1,000 - $980)	=	40
Var(CF_M)	=	$1,120

The variance of the merged firm's cash flow is only $1,120. Its standard deviation if $33.47, and the probability of bankruptcy goes to zero:

$$Z = \frac{\$480 - \$980}{\$33.47} = -14.94 > -3.0$$

Even though the merged firm's interest cost is $480, the sum of the unmerged firms' interest expenses, the standard deviation is so reduced that the probability of bankruptcy is zero. The Z-value far exceeds -3.0, the minimum value of the normal curve. With less than perfectly correlated cash flows, mergers reduce the merged firm's variance and risk of default.

Another way of examining the reduction in variance is to look at the merger in a portfolio approach. Assume that firms A and B have cash flow variances of 30 percent and a correlation coefficient of .40. If the merged firm is made up of 50 percent of firm A and 50 percent of firm B, the merged firm's variance and standard deviation will be

$$\sigma(CF_M) = \sqrt{Var(CF_M)}$$

$$= \sqrt{W_A^2\sigma_A^2 + W_B^2\sigma_B^2 + 2W_A W_B \sigma_{AB}\sigma_A\sigma_B}$$

$$= \sqrt{(.50)^2}(.30) + (.50)^2(.30) + 2(.50)(.50)(.40)(\sqrt{.30})(\sqrt{.30})$$

$$= \sqrt{.075} + .075 + .06$$

$$= \sqrt{.21}$$

$$= .4583.$$

The unmerged firms A and B had variances of 30 percent, whereas the merged firm has a variance of 21 percent. Firms A and B had standard deviations of .5477, that is, $\sqrt{.30}$ and the merged firm's standard deviation is only .4583. The portfolio approach reveals that mergers reduce the risk of the merged firm relative to the risks of the unmerged firms.

Since the variance of the merged firm falls, the merged firm could sustain a higher debt level than the sum of the unmerged firms. The existence of possibly additional debt capacity creates more highly leveraged firms. In the business world of taxation, leverage increases the stock prices and the total market value of the firm.

In contrast to those combinations that exhibit some organic consistency, there are those whose avowed purpose is *diversification.* Diversification has at times been promoted as a cure to almost all managerial difficulties. If one branch of the company runs into difficulties it is expected that some other operation will show enough profits to assuage the economic hurt. But diversification may also make it possible £or a losing division to drain away the returns from the profitable operation. On closer inspection, however, some diversified combinations reveal distinct economic or technical connections. The historic classic case is the ice and fuel company where men and equipment used £or delivering ice in the summer were diverted to delivering fuel in the winter. A whiskey distillery may expand into petrochemicals because, among other things, some of the engineering problems are similar. Some combinations have been motivated by historical relationships that may no longer exist. Where there is no logical relationship in the structure of a widely diversified combination, the reasons for the merger may rest on temporary tax advantages or perhaps on speculative manipulations. This type of combination may develop managerial or administrative problems and often does not survive intact for long.

5. COMBINATIONS CORRECTING ECONOMIC OR FINANCIAL IMBALANCES

Using the criterion that the economic or financial success of a combination is basically demonstrated by a rise in core earnings, potentially worthwhile merger situations have the following characteristics:

1. One or both of the firms has some imbalance in its financial or economic structure that can be offset by the merger.
2. The combination creates or increases market dominance.
3. The merger enables the firm to take certain tax savings.
4. The merger reduces unused duplicate facilities.

A merger that attempts to correct financial or economic imbalances is perhaps the one type which may lead to socially desirable results. For example, the new firm could lower costs by eliminating duplicate facilities. The merger releases productive factors for more valuable uses elsewhere. Presumably these factors were previously underutilized. In other words, the independent firms' output structures were unbalanced – i.e., they did not have an optimum mix of the productive factors.

The following is a list of merger possibilities arising from various imbalances in the companies' production or financial structure. In every case the firms were not operating with the optimum production or capital mix.

1. A firm with aggressive management and a relatively small asset base might combine with a firm with a large asset base but no new developing managerial talent.
2. A firm with fixed assets and a shortage of net working capital might merge with a firm with abundant working capital.
3. A firm with a heavily leveraged financial structure could combine with one that had an ultra-conservative equity position.
4. A firm with a strong marketing position might unite with a firm, with a good production position.
5. A firm with solidly established products could combine with another company which had a topnotch research program.
6. A firm with heavy expansion plans could combine with a company having a strong liquidity position.
7. A firm faced with a seasonal demand for its product could combine with another firm whose product showed a reverse seasonal pattern.

Merger is not the only cure possible for a firm with an imbalance. A company can absorb its redundant productive factors by self-expansion (or contraction) in the proper direction. A combination, nevertheless, often is the fastest or cheapest way of making the adjustment.

6. COMBINATIONS INCREASING MARKET DOMINANCE

A merger that increases the company's degree of market dominance can be potentially profitable to the stockholders. Since the merger removes some competition, selling prices may be more easily maintained in the market, or the larger combined company can bargain better with its suppliers.[4] If the combined company can raise revenues or reduce costs, the net earnings available for all the stockholders rise.

Historically, financial promoters seem to have profited by putting together combinations involving increased market power. On the basis of its combined earning power, the new company may be worth more than its component parts and can carry a larger capital structure without loss to the investors. This possibility has, on occasion, been recognized by promoters who have organized the consolidation of two or more companies and as their reward have taken some of the securities in the combination. If the promoters were reasonable, the investors would still obtain increased profits even after allowing for the return on the additional securities floated and given out as a reward or an inducement to the promoters, lawyers, investment bankers, management people, and major stockholders involved. However, sometimes the organizers were too acquisitive or were overly optimistic in forecasting the earnings of the merger and, as a consequence, rewarded themselves excessively with new issues of stocks or bonds. The result was an *overcapitalized* company, a company whose earnings were inadequate to support a market price for its capital structure equal to its *stated* or *par* value.

Although combining to increase market power can profit promoters and stockholders, its overall effect probably reduces the amount of workable competition in the economy. In general, American tradition has been against private attempts to control market forces. This tradition has been expressed (although not always strongly enforced) in a series of legislative acts including the Sherman Anti-Trust Act of 1899, the Clayton Act of 1914, and the Celler Anti-Merger Amendment of 1950 to the Clayton Act. As the law now stands, mergers (or acquisitions of the assets of other firms) that tend substantially to lessen competition are prohibited. What constitutes a lessening of competition is, of course, subject to judicial interpretation. Nevertheless, the rule was construed widely enough in 1958 to prevent the merger of Bethlehem Steel Corporation and Youngstown Sheet and Tube, even though competition between these two geographically separated companies existed in only a small part of their output.[5] The court held the view that both companies were essentially strong and that their merger would eliminate a wide area of *potential* competition. White (1982) found little evidence that the increase in the share of value-added in the US was due to an increase in aggregate concentration. White found that the increase occurred before the large conglomerate merger activity of the late-1960s.

7. COMBINATIONS FOR TAX ADVANTAGES

The present corporation profits tax law allows for a tax loss carry back of three years and a tax loss carry forward of five years from the year the loss occurred. For example, suppose a corporation shows a deficit on the current year's operations of $1,000,000. It can apply this loss against the profits of the last three years and if it has earned *at least* $1,000,000 taxable profits in these years, the Treasury refunds the company approximately $350,000. If, however, past profits are insufficient to cover the loss, the excess loss may be used to reduce the taxable profits of the next five years. Of course, in any case the total reduction in tax liability cannot exceed $350,000.

A *merger* for tax savings may take place when a firm with a tax loss carry-forward cannot earn enough itself to use its tax credit. Since the law allows the merged companies to consolidate their earnings, the tax loss carry forward enables the new firm to reduce its tax liabilities regardless of which division originated the losses. Thus a firm with a tax loss credit of $1,000,000 can offer to a potential merger partner the possibility of saving $350,000 in taxes on future income. In a sense the loss firm brings an extra asset to the union which has to be considered in setting the merger terms.

The potential tax credit never equals the actual loss. In spite of tax credits, it is very difficult to get rich by taking losses. If a company's projected revenues do not cover out-of-pocket costs, its past losses have value in a merger, but merger or not, there is no reason to continue its operations. The company's operations will be closed down, and unless its assets can be turned to something else, it will be liquidated either *before* or after the merger. If it is liquidated before the merger, it becomes what is known as a corporate shell. As a matter of fact, there is occasional trading in these corporation shells-firms which have no assets but do have a charter and tax losses which may be used by other profitable companies.

Under the old tax laws, established stable earning firms could well undertake some risk projects since losses, if any, could be offset for tax purposes against solid current earnings. Some losses would be recovered through reduced taxes. On the other hand, a new firm was at a disadvantage because it would have no established earnings upon which the taxes might be reduced. Under the present tax law, however, a company experiencing losses has two alternatives. It may continue to operate, hoping eventually to make profits against which its loss carry-forward will be useful, or, if the situation is hopeless, it will close down and look for a tax merger which will return part of the losses it has suffered. The opportunity of obtaining some return of losses through a merger for tax purposes is thus the sole value of the loss carry-forward provision to an unsuccessful new enterprise which discontinues operations. The possibility of a new company obtaining some return of possible losses through a merger helps redress the odds on a risk venture, as opposed to the more favorable conditions for taking chances of older and larger companies. And if the conditions were thus unaltered in favor of established firms, the force of dynamic new competition would be yet weaker, and the forces which encourage the growth of oligopoly and business concentration even stronger.

To sum up, the loss carry-forward tax credit was designed (1) to equalize the tax burden for firms having a given rate of return but whose income pattern was erratic with firms having the same rate of return at a more stable level; and (2) to improve the expected return for new risk ventures. The latter function is actually attained by allowing a loss company to bring its tax credit into a merger. Harris, Stewart, and Carleton (1982) did not find that the tax loss carry-forward variable useful in predicting acquired firms in the 1974-1977 period.

8. THE LARSON-GONEDES EXCHANGE RATIO MODEL

It has been held that mergers often involve firms with differing price-earnings (P/E) multiples. Larson and Gonedes (1969) developed an exchange ratio model that is both theoretical and highly testable. The model can be developed form an assumption that the acquiring firm wants to project a growth image so that the market will capitalize its earnings at a high price-earnings multiple. As the firm acquires smaller firms (in terms of the firms; price-earnings multiples), the earnings of the acquired firms are capitalized at the acquiring firm's higher price-earnings multiple. The merger results in a higher market price for the acquiring firm.

Assume two firms, A and B, can be represented by the following data:

	Firm A	Firm B
Earnings (E)	$20 million	$ 5 million
Shares Outstanding (S)	2 million	1 million
Earnings Per Share (EPS)	$10	$ 5
Stock Price Per Share (P)	$160	$50
Price-Earnings Multiple (P/E)	16	10

Firm A is interested in acquiring firm B and is willing to pay firm B's stockholders $60 per share for their stock. Firm B's stockholders are delighted, because they have immediately profited $10 per share. If firm A is willing to pay $60 per share for firm B, the exchange ratio, ER, is

$$ER = \frac{P_B}{P_A} = \frac{\$60}{\$160} = .375.$$

To pay firm B's stockholders, firm A can issue firm B's stockholders (.375) 1,000,000 shares or 375,000 shares of firm A's stock. If a stockholder in firm B before the merger owned 100 shares of stock, worth $5,000, he now owns 37.5 shares of firm A's stock. Following the merger, the former stockholder of firm A has holdings worth $6,000, that is, 37.5 x ($160). His gain is $1,000 because of the merger.

We must now examine whether firm A's stockholders will profit. If firm A pays firm B's stockholders $60 per share and issues 375,000 shares, the merger is very profitable for firm A's stockholders as long as the market allows firm A's price-earnings multiple to remain at 16. Following the merger, firm AB is represented as follows:

Firm AB		
Earnings	=	$20 million + $5 million = $25 million
Shares Outstanding	=	2,000,000 + 375,000 = 2,375,000
EPS	=	$10.53
Price	=	P/E (EPS) = 16 ($10.53) = $168.48

Firm A's stockholders have profited $8.48 per share because of the merger. Notice, however, that firm A's stockholders profited only because the market did not adjust the firm's price-earnings multiple after the merger. A decrease in the price-earnings multiple of the merged firm could well wipe out the acquiring firm's gains.

In the absence of synergy, Larson and Gonedes held that firm A's price-earnings multiple should fall as a result of the merger. The price-earnings multiple of the merged firm, θ, should be the weighted average of the merging firms' price-earnings multiples in the absence of synergy:

$$\theta = \frac{P_A(S_A) + P_B(S_B)}{E_A + E_B}$$

$$= \frac{\$160(2{,}000{,}000) + \$60(1{,}000{,}000)}{\$20{,}000{,}000 + \$5{,}000{,}000}$$

$$= 15.2.$$

If the market does not adjust for the decline in aggregate real growth after the merger, a fallacious increase in market price can take place. The whole phenomena may be classed as illusory growth.[6] If the price-earnings multiple of the merged firm is equal to θ, there are no profits for the acquiring firm's stockholders; the price of firm A's stock remains at $160:

$P_A = \$10.53(15.2) = \$160.06$

The presence of synergy would be shown in a price-earnings multiple of the merged firm exceeding θ. If the price-earnings multiple of the merged firm is less than θ, the acquiring firm's stockholders suffer a loss and would oppose the merger.

Firm A's shareholders should be willing to pay firm B's stockholders a price dictated by a maximum acceptable exchange ratio, ER_A. Larson and Gonedes derived this to be

$$ER_A = \frac{\theta(E_A + E_B) - (P/E_A(E_A)}{(P/E)_A E_A\left(\frac{1}{S_A}\right)(S_B)} \tag{6}$$

For example, if the market were to allow the merged firm's price earnings multiple to remain at 16, firm A's stockholders could afford to pay firm B's stockholders a price far exceeding $60 per share and still reap merger profits:

$$ER_A = \frac{16(\$25{,}000{,}000) - 16(20{,}000{,}000)}{16(\$20{,}000{,}000)\left(\frac{1}{2{,}000{,}000}\right)(1{,}000{,}000)}$$

$$= .500.$$

An exchange ratio of .500 implies a maximum acceptable price of $80 per share for firm B's stock:

$$P_B = ER_A(P_A) = .500(\$160) = \$80.$$

If firm A pays firm B stockholders a price of exactly $80 per share, firm A's stockholders are indifferent to the merger because the price of firm A's stock remains at $160 per share. Firm A must issue 500,000 shares, that is, .5 (1,000,000), to acquire firm B. Following the merger, firm A is represented as:

				Firm A
Earnings				$25,000,000
Shares Outstanding				2,500,000
EPS				$10
P/E				16
Price	=	$160	=	$10(16).

Firm A's stockholders profit as long as the exchange ratio is below .500. If the market allows a price-earnings multiple of the merged firm to remain at 16, firm A cannot pay a higher price than $80 per share for firm B and still profit from the merger. Of course, firm A would prefer to offer firm B's stockholders as small a price as possible for their stock to consummate the merger. If firm A paid firm B's stockholders a price of $60 per share, the merger premium, MP, would be given in terms of the actual exchange ratio, AER:

$$MP = \left(\frac{AER(P_A) - P_B}{P_B}\right)(100) \tag{7}$$

where

$$AER = \frac{\$60}{\$160} = .375$$

$$MP = \left(\frac{.375(\$160) - \$50}{\$50}\right)(100) = 20$$

A 20 percent merger premium would have been paid.[7]

Synergism will result only if θ exceeds the weighted average of the merging firm's price-earnings multiples. If

$$\theta > \frac{P_A(S_A) + P_B(S_B)}{E_A + E_B},$$

the market value of the merged firm exceeds the market values of the unmerged firms. If ER > P_B/P_A, the acquired firm profits more proportionally than the acquiring firm. The reverse occurs if ER < P_B/P_A. A firm should engage in a merger only if it benefits its stockholders. The relative bargaining strengths of the acquiring and acquired firms determine the distribution of the merger gains. Note that high price-earnings multiples, generally resulting from stock price, allow more mergers to be profitable. The history of mergers in the United States substantiates the positive association between stock prices and number of mergers.

9. VALUATION OF A MERGER CANDIDATE

The use of discounted cash flows can value a potential merger candidate. Rappaport (1979, 1981) developed a logical and consistent framework for evaluating the expected cash flow of a merger candidate. The capital budgeting techniques of Chapter 11, the risk adjustments of a beta estimation illustrated in Chapter 14, and the cost of capital calculations of Chapter 10, are used in this section. The Rappaport (1979) framework for merger valuation addresses several issues:

1. What is the maximum amount to pay for the target company?
2. What are the primary areas of risk?
3. What are the earnings, cash flow, and balance sheet implications of the acquisition?
4. How should the acquisition be financed?

Let us analyze a potential merger candidate for an acquiring firm with the following capital structure:

Long-Term Debt	$5,647
Equity	9,063
Total Long-Term Capital	$14,710

The firm has a bond rating of AA3 (Moody's AA) and a beta of 0.84 versus the S&P 500 Index.

The cost of capital, k_c, can be calculated by using an acceptable market risk premium and the current AA bond yield of 5.6%. The Ibbotson and Sinquefield market risk premium of 8.8 percent was based on the 1926-1993 period. If we use the Ibbotson and Sinquefield data for the 1951-2002 period, found on WRDS, we find an average annual rate of return on equities of 12.53%, and a corresponding average Treasury bill yield of 5.15%, implying a 7.38% market risk premium. The cost of equity capital for our acquiring firm is:

$$k_e = .0515 + (.0738)\ .84 = .1135$$

The cost of equity capital, via the Capital Asset Pricing Model, is 11.35%. The weighted average cost of capital may be calculated as:

$$k_c = k_e \left(\frac{E}{D+E}\right) + k_d \left(\frac{D}{D+E}\right)(1-t)$$

$$k_c = .1135 \left(\frac{9063}{5647+9063}\right) + .056 \left(\frac{5647}{5647+9063}\right)(1-.35)$$

$$= .084$$

The acquiring firm’s weighted average cost of capital is the appropriate discount rate for valuating merger candidates.

A potential merger partner has current sales level of $100 million, depreciation of $5 MM, debt value of $50 million, and 10 million shares outstanding. Depreciation is assumed to increase at 20% annually. One can further assume the following scenarios over a ten-year valuation period:

Years	1-5	6-10
Growth in sales	10%	15%
Profit margin	30%	32%
Tax rate	35%	35%
f = capital expenditures as a % of sales growth	25%	25%
w = working capital increase as a % of sales growth	10%	10%

The forecasted sales and cash flow levels are shown in Table 1 and the discounted cash flow are shown in Table 2. The discounted cash flow of the acquired firm is $281.52 million during the ten-year holding period. One capitalizes the ten-year earnings on an infinite period, and discounts the result from its ten-year discounted cash flow.

Market value of the firm	$639.70 MM
– Debt	50.00 MM
Market Value of Equity	$589.70 MM

Table 1. Forecasted Sales, Cash Flow ($ MM)

	Year of Acquisition									
$Sales_0 = 100$	1	2	3	4	5	6	7	8	9	10
Sales	110	121	133.1	146.4	161.1	185.3	213.1	245.1	281.8	324.0
Operating Expenses	77	84.7	93.2	102.5	112.8	126	144.9	166.7	191.6	220.3
EBIT	33	36.3	39.9	43.9	48.3	59.3	68.2	78.4	90.2	103.7
(t=.35) = Taxes	11.6	12.7	14.0	15.4	16.9	20.8	23.9	27.4	31.6	36.3
Op.Earnings after Taxes	21.4	23.6	25.9	28.5	31.4	38.5	44.3	51.0	58.6	67.4
Depreciation	6.0	7.2	8.6	10.4	12.4	14.9	17.9	21.5	25.8	31.0
Δ Sales	10	11	12.1	13.0	14.7	24.2	27.8	32.0	36.7	42.2
– CE (f = .25)	-2.5	-2.8	-3.0	-3.3	-3.7	-6.1	-7.0	-8.0	-9.2	-10.6
– Δ NWK (w = .10)	-1.0	-1.1	-1.2	-1.3	-1.5	-2.4	-2.8	-3.2	-3.7	-4.2
Cash Flow	23.9	26.9	30.3	34.3	38.6	44.9	52.4	61.3	71.5	83.6

Table 2. Discounted Cash Flow

Year	CF	Discount Rate	PV(CF)
1	23.9	.9225	22.05
2	26.9	.8571	23.06
3	30.3	.7849	23.78
4	34.3	.7241	24.84
5	38.6	.6680	26.25
6	44.9	.6165	27.68
7	52.4	.5685	29.79
8	61.3	.5247	32.16
9	71.5	.4838	34.59
10	83.6	.4464	37.32
			$281.52

Present Value of Discounted Ten-Year earnings, $earn_{t+10}$.

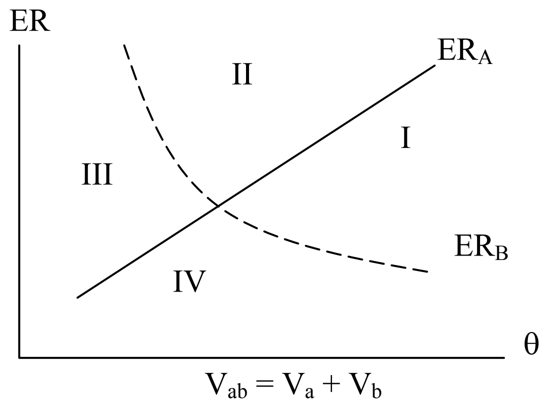
$$PV(Earn_{t+10}) = .4464\left(\frac{67.4}{.084}\right)$$

$$= \$358.18$$

The total present value is the present value cash flow in the ten-year period, $281.52 MM, plus the capitalized ten-year earnings, $358.18, or $639.70 million. One should subtract the assumed debt, $50 MM, from the present value of the firm's cash flow, to derive its estimated value of equity. The market value of equity is $589.70 and given the acquired firm's 10 million shares, the fair value of the acquired firm's equity should be $58.97 per share. The Rappaport merger valuation framework assumes that the acquiring firm can produce reasonably accurate forecast of projected earnings and cash flow. One pays in an all-cash manner if consistent with the acquiring firm's current liquidity and targeted debt-to-equity ratio.

10. TESTING FOR SYNERGISM

Research has established that the market anticipates mergers at least seven months before they occur. Mergers generally occur during periods of rising stock prices, and thus tests for synergy must consider market movements. Adjusting for systematic risk, Halpern (1973) found that the merger gains before the announcement are divided equally between the acquiring and acquired firms. Conn and Nielsen (1977) tested evidence of merger synergism, as defined by the Larson and Gonedes model, at the month of the merger announcement, the month of the merger consummation, and the month following merger consummation; they found support for the Larson and Gonedes model. Harris, Stewart, and Carleton (1982) provide evidence that mergers in the 1970s that the price-earnings multiples of the acquired firms were significantly less than that of non-acquired firms.



In terms of the Larson and Gonedes exchange ratio model and the ER-0 diagram, mergers in quadrant 1 profit both firms' stockholders. Above the ER_B rectangular hyperbola, the acquired firm's stockholders win since the merger premium is relatively large. To the right of ER_A, the acquiring firm's stockholders win as the market maintains

$$\theta > \frac{P_A(S_A) + (S_B)}{E_A + E_B}. \tag{8}$$

Conn and Nielsen found that 78 of 131 mergers between 1960 and 1969 occurred in quadrant 1 in the month of announcement, supporting Larson and Gonedes' model.

However, by the time of the merger consummation and the month following the merger consummation, only 72 and 67 of the 131 mergers were profitable to both firms. In the month following consummations, only 51 percent of the mergers were profitable to both firms' stockholders. The acquired firms' stockholders lost in 24 of the 131 mergers in the month following consummation whereas the acquiring firms' stockholders lost in 58 cases.[8]

11. DO MERGERS ENHANCE SHAREHOLDER WEALTH?

The reader probably expects the stockholders of acquired firms to earn positive, and highly significant excess returns. After all, merger premiums rose to 25-30 percent during the 1958-1978 period [Dodd and Ruback (1977)]. What about the acquiring firms? If the acquired firms' stockholders profit handsomely from a merger, should not the acquiring firms stockholders lose? Are mergers zero-sum events? Is wealth created by mergers? Let us examine much of the empirical evidence. Mandelker (1974) put forth the Perfectly Competitive Acquisitions Market (PCAM) hypothesis in which competition equates returns on assets of similar risk, such that acquiring firms should pay premiums to the extent that no excess returns are realized to their stockholders. The PCAM holds that only the acquired firms' stockholders earn excess returns. However, Mandelker studied mergers of 241 acquiring firms during the 1948-1967 period, and found that acquiring firms' stockholder earned 5.1 percent during the 40 months prior to the mergers, but excess returns decreased by 1.7 percent in the 40 months following the merger. Positive net excess returns (3.7 percent) were earned by the acquiring firms in the Mandelker study. Thus, Mandelker found no evidence that acquiring firms paid too much for the acquired firms. Moreover, the acquired firms' stockholders realized excess returns of 12 percent for the 40 month period prior to the merger, and 14 percent for the seven-month period prior to the merger.

The Mandelker results have been substantiated by much of the empirical literature. Dodd and Ruback (1977) found that successful acquiring firms' stockholders gained 2.8 percent in the month before the merger announcement during the 1958-1978 period, whereas the successful acquired firms' stockholders gained 20.9 percent excess returns. Dodd and Ruback found that the acquired firms' stockholders gained 19.0 percent even if the merger was unsuccessful, whereas the acquiring firms' stockholders gained less than one percent. The empirical evidence for the 1973-1998 period is consistent, from 20 months prior to the merger to its close, the combined firms' stockholders gain approximately 1.9 percent [Andrade, Mitchell, and Stafford (2001)]. Moeller, Schlingemann, and Stulz (2003) analyzed 12,023 mergers during the 1980-2001 period and found a 1.1 percent gain to acquiring firms shareholders.

Moeller *et al.* (2003) used a sample of public acquiring firms making acquisitions exceeding $1 million. Private acquired firms accounted for 5,583 of the 12,023 acquisitions involving subsidiaries. The private firm acquisitions tended to be more cash-financed (50.56%) than public firm acquisitions (29.57% cash, 55.32% in equity), and the subsidiary acquisitions were predominantly cash (75.92%). The three-day cumulative average returns (CARS) of the acquiring firms' deals were on average 1.1%; however, the acquisition of private firms produced higher CARS (1.50%) than the public firm acquisitions (-1.02%), but less than the subsidiary acquisitions (2.00%). Smaller-capitalized firms' acquisitions private firms financed by equity produced the highest CARS, whereas larger-capitalized, equity-financed acquirers produced the lowest CARS (-2.45%). The equity-financing of subsidiaries produced excess returns of 5.40%. In general, Moeller *et al.* found that cash-financing produced higher excess returns than equity deals, led by cash deals for private firms and subsidiaries. The cash acquisitions by small firms produced statistically significant excess returns. Large firms make poorer acquisitions. Rapport and Sirower (1999) noted that the large 1990s mergers involved more stock and less cash than the large 1980s mergers. Rappaport and Sirower state that the acquiring firm's management ask if its stock is under-valued; issuing new (more under-valued) shares would penalize current stockholders. Acquiring stocks should finance with stock if uncertain of synergy. Rappaport and Sirower (1997) calculate a stockholder value at risk (SVAR) which measures the merger premium divided by the market value of the acquiring firm before the merger announcement is made. The greater the merger premium and the greater the market value of the seller relative to the acquiring firm, then the higher the SVAR (if no post-acquisition) synergies are realized.

Mergers may enhance stockholder wealth; however, whereas Andrade, Mitchell, and Stafford further found that the target, or acquired stockholders gained about 23.8 percent for the 20 month period, consistent across the decades of the 1973-1998 period, the acquiring firms' stock-holders lost about 3.8 percent, during the corresponding 20 month period. For the largest merger in U.S. history prior to 1983, Ruback (1982) found that DuPont lost 9.89 percent ($789 million of stockholder wealth) in the month prior to the merger announcement whereas Conoco stockholders gained 71.2 percent ($3201.2 million) for the two-month period prior to the successful DuPont merger announcement.

Do mergers affect the firms' operations? Hall (1993) found that research and development (R&D) activities were not impacted significantly by mergers. Hall found no lessening of R&D spending. Healy, Palepu, and Ruback (1992) reported that mergers seeking strategic takeovers outperformed financially-motivated takeover. Strategic takeovers generally involved friendly takeovers financed with stock whereas financial takeovers were hostile takeovers involving cash payments. During the 1979-1982 period, for the 50 largest mergers, Healy, Palepu, and Ruback found that strategic takeovers made money for the acquiring firms whereas financial takeovers broke even. Acquiring stockholders of strategic acquisitions made 4.4 percent for five years post-merger, assuming no premiums paid, whereas financial takeovers earned the acquiring stockholders 1.1 percent. The premiums paid in financial takeovers were higher (45%) than in strategic takeovers (35%), and the synergies were lower in financial takeovers. Trimbath (2002, p. 137) found "no significant merger effect on net profit, operating profit, or market value" when analyzing firms purchased by Fortune 500 firms during the 1981-1995 period. Mergers generate a net gain for stockholders in the U.S. economy, but one prefers to be a stockholder in the acquired, rather than the acquiring, firm.

12. DIVESTMENT AND SPINOFF

A divestment or spinoff provides a contrast to a merger. Spinoffs reduce the scale of operations. A company may wish to dispose of a subsidiary; such an action is called a divestment.[9] A firm may want to dispose of a subsidiary company for economic or financial reasons, or it may have to divest itself of a given operation as the result of an antitrust action. A firm may voluntarily get rid of its interests in a subsidiary if the subsidiary operations do not mesh properly with the parent, or if the parent company needs funds for working capital or to finance other acquisitions or expansion. A divestment because of the antitrust laws takes place in compliance with court orders or a consent decree where the decision has been made that the ownership of the subsidiary gives the parent company too great an actual or potential dominance in the market. Divestments have also occurred in compliance with actions taken to simplify holding company systems.

Basically a company can dispose of an unwanted subsidiary in three ways: (1) by sale of the subsidiaries shares on the security markets,

(2) by selling the subsidiary to another company for cash or securities, or (3) by a spinoff. When subsidiaries are sold to another company, payment is often made in the notes, bonds, or the common shares of the purchasing company. A company which has technological know-how but not the necessary development capacity may find it profitable to sell a subsidiary with an experimental product to a market-oriented firm for shares of stock.

A spinoff consists of distributing the ownership shares in the subsidiary on a pro rata basis to the stockholders of the major company. Whereas the sale of the subsidiary (whether on the market so that it becomes an independent company or to another major company) brings the parent company either cash or new security investments, a spinoff decreases the parent company's stated assets with no off-setting increase. On the other hand, a spinoff may be the least upsetting to the management of the subsidiary (a new owning company may begin by shifting personnel around). The spinoff also saves the management of the parent company the effort and difficulty of negotiating a sale or organizing a security flotation. A spinoff spares the parent company worry about whether it best served its own stockholders in the sale price obtained for the subsidiary. Spinoffs have been criticized as an inefficient antimonopoly remedy since they leave the same ownership in charge of both companies. However, history seems to indicate that, in time, the sale and trading of stocks tends to change the ownership complexion in the separate firms. After a while the managements of the formerly related firms develop their own desires to excel, and competition between mother and daughter firm may be as intense as any other in the industry.

One factor for divestment is the shedding of an unsatisfactory acquisition or merger. Kaplan and Weisbach (1992) studied such divestitures. Kaplan and Weisbach found that 44% of the large acquisitions completed in the 1970s and early 1980s had been divested in the 1980s. Fifty-six percent of these divestments reported gains or no losses, whereas 44 percent reported losses on the sales. Kaplan and Weisbach found that the average sale price, deflated by the S&P 500, was 90 percent of the purchase price. Conglomerate mergers were most often divested.

13. SUMMARY AND CONCLUSIONS

Mergers and acquisitions have been a major source of corporate growth and economic concentration during the past 125 years. The empirical evidence is mixed; most acquired firms' stockholders profit handsomely with excess returns exceeding 25 percent whereas acquiring firms' shareholders earn excess returns of only about 1 to 1.50 percent.

Notes

[1]Although mergers, combinations, and acquisitions are exciting events of great interest to the financial community, they do not represent the most common method through which even individual companies grow. Most firm growth is direct growth, which takes place quietly and is financed either by internal sources or floating new securities. A study of 74 large companies showed that of their growth from 1900 to 1948, 75 per cent was direct growth and only 25 per cent was accounted for by mergers. See, J. F. Weston*, The Role of Mergers in the Growth of Large Firm*, University of California Press, 1953.

[2]Thus Standard Oil of New Jersey, the U.S. Steel Corporation, or the original Bethlehem Steel Corporation, although they owned many subsidiaries, were not usually thought of as holding companies.

[3]In the 1930's investors in holding companies suffered heavy losses, and this fact, plus the exposure of legislative and operating scandals involving some promoters of holding companies, led to the passage by Congress of the Public Utility Company Act of 1935. Some of the major provisions of this legislation are:

1. Holding companies were prohibited over the third level-one operating company and two holding companies. That is, a holding company structure could go up to the grandfather level but not beyond. This "great-grandfather death clause" was designed to restrict the excessive leverage possible in the holding company 'structure.
2. Holding company systems were to be consolidated and simplified to develop some aspect of geographical contiguity. If the holding company is to serve an economic, function, the location of its operating companies should have some geographical logic.
3. "Upstream" loans were made, illegal. An upstream loan is made from a lower level company to a higher one. A holding company that serves a function should help to finance its operating companies, and not the other way around. The request for an upstream loan could not be resisted by a captive operating company even though the purpose of the loan was to bail the holding company out of a financial difficulty, and its net effect might be to deplete the assets of the operating company without necessarily rescuing the holding company.
4. Service and construction companies organized by the holding company system to work for operating companies were required to be nonprofit. In the usual case, there is no felt need to regulate intercompany prices because the resulting profits are only a shift of earnings among the various companies. However, in the public utility fields excessive service charges or construction costs could affect the rate base and thus may be borne eventually by the consumers. These rules and other provisions of the Public Utility Act of 1935 aroused considerable antagonism in the business community.

[4]A firm which is able to reduce the prices paid its suppliers shows no true example of external economies. The result is merely a backward shifting of costs.

[5]Bethlehem Steel was dissolved in bankruptcy four decades later.

[6]This problem is described in more detail in Chapter 22.

[7]The minimum θ consistent with the profitability constraint, that the merged firm's price must be at least as great as the acquiring firm's price, is given by

$$\theta = \frac{P_A[AER(S_B) + S_A]}{E_A + E_B}$$
$$= \frac{\$160[.375(1{,}000{,}000) + 2{,}000{,}000]}{\$20{,}000{,}000 + 5{,}000{,}000}$$
$$= 15.2.$$

Notice the minimum θ consistent with the acquiring firm's profitability constraint equals the weighted average price-earnings multiple for the merging firms.

If firm A paid firm B's stockholders $70 per share for their stock, the actual exchange ratio would be .4375 and the merger premium would be 40 percent. The minimum θ consistent with merger profitability would be

$$\theta = \frac{\$160[(.4375)1{,}000{,}000 + 2{,}000{,}000]}{\$25{,}000{,}000}$$
$$= 15.6.$$

If firm A is willing to pay firm B's stockholders a 40 percent merger premium, the market must allow the merged firm to maintain at least a 15.6 price-earnings multiple for the merger to profit the acquiring firm's stockholders.

[8]Harris *et al.* (1982) found that acquired firms had significantly lower price-earnings multiplier than acquiring firms.

[9]Sometimes the subsidiary interest is a branch, a by-product operation, or plant, and is not independently incorporated. If so, an initial step of incorporation would have to be taken before the subsidiary can be relinquished.

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Problems

1. The following are the possible rates of return before taxes and the a-priori probabilities on an investment project:

Rate-of-Return	apriori probabilities
50%	.05
40	.08
30	.15
20	.25
10	.17
0	.12
-10	.10
-20	.08

a. If the tax rate is 35% and there is no offset for losses, what is the expected rate of return after taxes on this investment?
b. What is the expected rate of return after taxes if a full offset for losses can be obtained?

2. A firm is considering making an acquisition. Given the following data, what should the firm offer as a purchase price, if the acquiring firm has a five-year-ahead cash flow valuation horizon?

Acquiring Firm Data:
Long-Term Debt is $19,986 MM,
Stockholder Equity is 27,884 MM,
The current risk-free rate is 1.87%,
The relevant market risk premium is 8.8%,
Firm beta is 1.05 (Value Line),
Tax rate = 35%,
and the AAA bond yield is 5.47 %

Potential Acquired Firm Data:

Sales, 1998	$17,000,000
Sales, 2003	30,000,000
Net Income, 2003	2,250,000
Depreciation, 2003	750,000

Change in Net Working Capital = .1*Change in Sales
Capital Expenditures = .15*Change in Sales

Chapter 19

LIQUIDATION, FAILURE, BANKRUPTCY, AND REORGANIZATION

Not every company justifies the confidence its original investors placed in it. A free enterprise system is one of profit and loss. There is no guarantee that all capital will earn the "normal" rate of return. In a world of change, where sure knowledge of the future is lacking and decisions are made under conditions of more or less uncertainty, the operation of any business is a calculated risk. The data in Figure 1 depicts the failure rate per 10,000 firms in the United States during the 1930-1998 period.[1] The reader obviously notes the high level of business failures during the Great Depression. The reader may be surprised by the high level of failures during the 1980s, given the excellent stock market performance. Failures have risen substantially during the past forty years, and were very high during the 1990-1992 period. As noted in Chapter 5 there was a deterioration in the Altman Z score, the bankruptcy prediction model, during the 1963-2003 period as a result of falling profit margins and sales efficiency. The large debt issuance of the 1975-2003 period, combined with high interest rates during several years of the period, was no doubt an important factor in the rising failure rate. Buell and Schwartz (1979) modeled the failure rate in the U.S. during the 1950-1978 period as a function of the total debt to total assets ratio and the variation about the time trend of the level of employment. Buell and Schwartz reported the increases in the debt ratio were (highly) statistically associated with the failure rate whereas the failure rate is negatively associated with employment. an economic downturn is associated with decreasing cash flows and lower operating cash flows of firms. Under an increase in financial leverage, a favorable turn in economic events can bring a firm high earnings; however, on the other hand, a recession in demand or a miscalculation of costs may entail substantial losses.

The broad question explored in this chapter concerns the course of action open to the various classes of investors (suppliers of funds to the firm) in the event the company does not perform at a minimum level.

The Bankruptcy Reform Act of 1978 provides the formal procedures for the resolution of claims against the firm. The bankruptcy act provides for liquidation (Chapter 7) or reorganization (Chapter 11). A bankruptcy filing may be voluntary or involuntary.

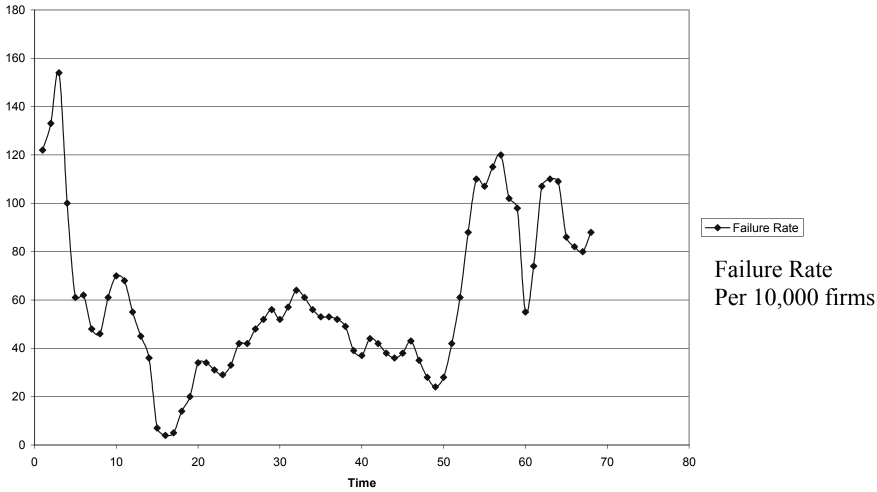

Figure 1. U.S. Failure Rate, 1920-1998

1. VOLUNTARY LIQUIDATION

Liquidation is the sale of the operating assets of a firm and their conversion into cash or other liquid assets. In most cases the cash is returned to the investors according to their legal priorities. The trustee appointed by the court shuts down the firm and sells its assets. Assets are distributed by the absolute priority rule (APR), where the court establishes the seniority, or hierarchy, of claims. No junior claims are paid until senior claims are fully paid.

Liquidations may be voluntary or involuntary. If it cannot properly meet its obligations, an involuntary liquidation may be forced upon the company by its creditors. Involuntary liquidation is one of the remedies in bankruptcy, whereas a voluntary liquidation is undertaken as a decision of the management passed upon by the shareholders. Whether voluntary or involuntary, liquidation is recommended whenever the capitalized value of the reasonably projected cash flow of the firm, i.e. its value as a "going concern," is below the appraised liquidation value of the company's assets.[2] In the case of voluntary liquidation, funds may be obtained from the sale of the assets could be used to buy market stock or bonds (in which case the liquidated firm will turn into an investment company[3]), or an entirely different type of business may be purchased. A partial liquidation means that some portion of the claims against the company are paid off and the other investors remain with the scaled-down firm.

The level of the cash flow of the firm determines the decision to liquidate. A firm may show accounting losses and yet the best course of action may be to continue operations. On the other hand, it may be eminently reasonable to withdraw funds from a firm which shows no explicit accounting loss.

1.1 A Liquidation Example

Table 1 shows an example of a firm which might consider dissolution even though its accounting profits are positive.

Table 1. The Liquidation of Company A

Company A
Condensed Operating Statement

EBITD	$1,000,000
Less Depreciation	200,000
EBIT	800,000
Interest	200,000
Earnings before taxes	600,000
Less Taxes	300,000
Income Available for Common	300,000

Position Statement

Assets		Liabilities	
Current Assets	$11,000,000	Current Liabilities	3,000,000
Fixed Assets	5,000,000	Fixed Liabilities	4,000,000
		Common Stock Equity	9,000,000
	16,000,000		16,000,000

1. Appraised liquidation value for the sale of the total assets = $13,000,000.
2. Going concern value of the firm on a cash flow basis assuming a necessary overall rate of return of 10 percent and a time horizon of 25 years, $\$1{,}000{,}000\ a_{25\,|10\%} = \$9{,}077{,}000$.
3. Rate of return on the liquid value of the equity on a net basis $\frac{300{,}000}{6{,}000{,}000} = 5.0\%$.

If the stockholders should decide to dissolve the firm, they would receive $6,000,000 (after paying off the creditors) for the $9,000,000 book value of their investment. On the other hand, the gross going concern value of their firm is only $9,077,000, leaving the shareholders with only $2,077,000 as the net ongoing value of their equity.

Viewing the situation from the net basis, let us assume that the going rate of earnings on equity capital for Company A's type of risk and potential return is 10 per cent; then the $6,000,000 obtained from liquidation could be invested to bring in at least $600,000 net instead of the present $300,000 net.

Basing the decision on the overall approach (that is, on the use of EBID) is preferable because it is always possible that an inadequate return on the equity is due to a suboptimal capital structure or an especially high allowance for depreciation. One should emphasize that the book value of the assets (or equity) really is irrelevant to the decision except as the book value of certain assets may give a rough indication of their liquidation value. The book value of fixed assets may diverge widely from liquidation, but the liquidation value and the book value of current assets may run fairly close. The argument for liquidation in this case is the assumption that there is no strong reason for forecasting any appreciable improvement in the earnings of the firm for twenty-five years.

1.2 Remaining in Business

Table 2 illustrates the position of a firm which might as well stay in business even though it shows an accounting deficit of $100,000 annually. It can realize only $5,500,000 from the sale of its assets leaving only $500,000 for the equity holders after paying the creditors. On the other hand, it has a gross going concern value of $7,600,000 leaving a net value of $2,600,000 for the equity after allowance is made for liabilities. It may be difficult to understand how this firm can have any value when the operating statement shows a net loss. However, after considering non-cash depreciation charges Company B presently returns $800,000 cash flows annually in available net funds after the payment of interest.

Table 2. Company B is Retained as an On-going Concern

Company B
Condensed Operating Statement

EBITD	$1,000,000
Less Depreciation	900,000
EBIT	100,000
Interest	200,000
	(100,000)
Profit Taxes	-0-
Deficit on the Common Equity	(100,000)

Position Statement

Assets		Liabilities	
Current Assets	$ 3,000,000	Current Liabilities	1,000,000
Fixed Assets	13,000,000	Fixed Liabilities	4,000,000
		Common Equity	11,000,000
	16,000,000		16,000,000

1. Appraised liquidation value for sale of total assets = $5,500,000.
2. Going concern value of the firm on a cash flow basis, assuming a necessary overall rate of return of 10 percent and a 15 year projection basis; 1,000,000 $a_{15|10\%}$ = $7,600,000.

These funds could be reinvested as risk capital to bring a return of perhaps 10 per cent ($80,000 additional per year), or used to repay the long-term debt, reducing the principal and interest costs. It follows that, in a comparatively brief period, the accounting statements would show a profit.[4]

In addition to the return on the investment of the net new funds of $800,000, the original investment in the firm will, under our assumptions, continue to produce a gross cash flow of $1,000,000 annually for at least fifteen more years. The owners of the firm will retrieve more of their investment if they continue to operate than if they liquidate.

To sum up, the decision to liquidate should not be based on the accounting net profits or losses, but on whether the company earns an "adequate" rate of return on the "withdrawable funds" within the firm. A firm can show an accounting profit because all the implicit costs of capital are not recognized. If the firm were explicitly charged for all its funds (including equity) at the going rate, it would show a loss. It might be preferable to liquidate such an enterprise. On the other hand, a company may show an accounting loss because in the past it has misdirected some of its investment. However, the firm may show a good return on the net withdrawable funds. Neither one of these enterprises can be considered "successful", but in the second case, a smaller net loss results if operations continue.

2. FAILURE

Failure is the inability of a firm to meet its obligations as they come due.[5] Failure may result from physical losses or disasters, robbery or embezzlement; usually, however, it occurs because of a more or less prolonged period of operating losses, or because the company's funds have been invested in assets which are not efficient or marketable.

The two main reasons for failure are often given as the lack of adequate working capital, or poor management. Inadequate working capital may be the proximate cause of a firm's failure but not the basic cause. Every business that fails has inadequate working capital at the time of failure. However, a firm that shows earnings or potential earnings should be able to keep or acquire working capital. Perhaps inadequate working capital is a cause of failure in a new small business when the organizers fail to provide enough working capital to survive a period of initial losses. Even here, we may doubt whether more working capital would have insured success or merely prolonged the period of the firm's duration.

Poor management may be a basic cause for the firm's financial disaster. Mismanagement shows itself in many ways; in a failure to control costs, in the inability to foresee and provide funds for obvious contingencies, or in the wasting the firm's resources in unproductive programs. The ability of the management is a qualitative matter; it cannot be adduced from a single mishap, but the management may be suspect if the firm seems subject to a succession of economic errors.

The most important reason for failure is simply bad business conditions. Bad business conditions may be general, or centered in a particular industry, or in a particular geographic area. High interest rates and high unemployment are often associated with bad economic conditions. One could alternatively examine the relationship between failures and the composite index of leading economic indicators discussed and analyzed in Chapters 12 and 13. If demand falls off sharply, even a competent management may be unable to keep its company afloat. Of course, some will argue that a really good management would have foreseen the economic storm far enough in advance to have a program for saving the firm. But if a firm attempts to cover all risks, it is likely to earn little or no profits. Moreover, the management of a company whose assets are specialized for the requirements of a particular industry may not be able to do much if there is a severe decline in demand.

2.1 Informal Remedies

The failure of a firm puts its future into the hands of its creditors. Since the firm cannot meet its obligations, i.e., cannot pay its debts, the law removes the major control from the owners and gives it to creditors so that they may salvage whatever they can to reduce their losses. The creditors (liability holders) can press their claims against the firm through various devices of differing degrees of legal formality. The debt holders may, without going through the courts, form a creditors' committee to guide and supervise the management of the company through a period of hard times, and by pressing for operational economies, holding sales, collecting accounts, and minimizing purchases, attempt to bring the firm back to a current basis.

Other procedures for dealing with failure, without necessary recourse to the courts, are composition and quasi-reorganization. The firm may be wholly or partially liquidated by a composition of creditors. After the creditors are paid a proportion of their claims on a pro rata basis out of the surrendered assets of the company, a composition relieves the owners of any further liability. In some cases various sorts of quasi-reorganization may be attempted. For example, the creditors may all take an agreed-upon cut in their claims if the stockholders put additional funds into the businesses; if the plan goes through, the stockholders may continue to run the company.

3. FORMAL PROCEDURE

The device likely to be used in more complicated cases (or where perhaps there is distrust among the creditors or between the creditors and the owners) is bankruptcy. Bankruptcy places the affairs of the company under the custody and protection of the courts until the disposition of the various claims can be decided.

No matter what legal device the creditors use to handle the situation of a failed company, there are only two basic functional remedies, reorganization or liquidation. In the next section on bankruptcy discusses the remedies in more detail.

4. BANKRUPTCY

Bankruptcy is a process by which a financially distressed individual or firm can purge itself of debt by surrendering all its assets to the court. These assets are used, as far as they extend, to satisfy the creditors' claims. Once an individual passes through bankruptcy, he can start his economic life anew. He can acquire new holdings, and he need not pay his old debts from these new holdings unless he so volunteers. Bankruptcy is a humane innovation in the law, when one considers that it was not so long ago that persons with unpaid debts might be plunged into debtor's prison. The concept of a legal release from hopeless debt was so important to our American forefathers that the right to establish uniform bankruptcy laws was given to Congress in Article I, Section 8, of the Constitution.

4.1 The WorldCom Case

Looking at current developments, the largest bankruptcies of the 1980-2002 period are shown in Table 3. The largest bankruptcy was that of WorldCom in 2002.Worldcom, Inc. declared bankruptcy in July 2002. Using 2001 data to calculate the Altman Z, as was done in Chapter 5 for Dupont and IBM, one finds a value of 1.30 for WorldCom in 2001. The WorldCom value was less than the critical level of 2.000, and indicated potential bankruptcy problems. There can be several criticisms of the Altman Z calculation of this period. First, the end-of-year financials may not have been known much before May, and there may have been little time for persons to calculate the Altman Z score. Second, if one used data of year 2000 to calculate the Altman Z, one obtains a 1.47 value, less than its critical score, but not a terrible value, such as we saw for Lucent in Chapter 5. A third problem is that WorldCom is a telecommunications firm, a utilities firm, and was shown in Chapter 5, utility firms had lower Altman Z scores than manufacturing or industrial firms. In fact, the WorldCom Altman Z score exceeded the utilities median (1.18) in 2001. Had we produced an updated Table 3 using data from the same website in August 2007, we would have added Calpine Corporation, with $27.22 billion of assets (in December 2005) and Delta Air Lines Inc., with assets of $21.80 billion (in September 2005) to the largest corporate bankruptcy list.

4.2 Bankruptcy Procedures

Bankruptcy can be either voluntary or involuntary. Voluntary bankruptcy takes place when the owners, seeing the hopelessness of their position, petition for bankruptcy and place the firm's assets into the hands of the court. Involuntary bankruptcy may take place if creditors believe that the situation is deteriorating, that the owners may be attempting to withdraw funds to the eventual detriment of the creditors, or that the owners may be preferring (i.e., favoring) some creditors over the others, they may "throw the firm into bankruptcy." The acts of bankruptcy consist of a list of actions, similar to the ones described above, which legally entitle the creditors to institute bankruptcy proceedings. The purpose of bankruptcy in this case is to conserve the firm's resources, such as they may be, for the benefit of all the creditors according to the legal strength of their claims.

Regardless of how the firm came into the hands of the law, the court's first task is to appoint an official entitled a "trustee in bankruptcy." The trustee runs the company until the final decision is made as to how best to dispose of the firm's affairs with the least loss to the creditors. The two major alternatives are liquidation or reorganization. Just as in the case of voluntary liquidation, the rational economic basis for the choice rests on whether or not the going concern value of the projected funds inflow of the firm exceeds its liquidation value. However, where the firm (e.g., a railroad) is adjudged to perform a necessary public service the remedy of liquidation may not be allowed; only reorganization may legally permissible. The creation of Amtrak is an example of a public enterprise created by the failures of many private railroads.

Table 3. The Largest Bankruptcies 1980-Present

Company	Bankruptcy Date	Total Assets Pre-Bankruptcy
WorldCom, Inc.	7/21/02	$103,914,000,000
Enron Corporation*	12/2/01	63,392,000,000
Conseco, Inc.	12/18/02	61,392,000,000
Texaco, Inc.	4/12/87	35,892,000,000
Financial Corp. of America	9/9/88	33,864,000,000
Global Crossing Ltd.	1/28/02	30,185,000,000
UAL Corp.	12/9/02	25,197,000,000
Adelphia Communications	6/25/02	21,499,000,000
Pacific Gas and Electric Co.	4/6/01	21,470,000,000
MCorp	3/31/89	20,228,000,000
Mirant Corporation	7/14/03	19,415,000,000
First Executive Corp.	5/13/91	15,193,000,000
Gibraltar Financial Corp.	2/8/90	15,011,000,000
Kmart Corporation	1/22/02	14,600,000,000
FINOVA Group, Inc. (The)	3/7/01	14,050,000,000
HomeFed Corp.	10/22/92	13,885,000,000
Southeast Banking Corp.	9/20/91	13,390,000,000
NTL, Inc.	5/8/02	13,003,000,000
Reliance Group Holdings, Inc.	6/12/01	12,598,000,000
Imperial Corp. of America	2/28/90	12,263,000,000
Federal-Mogul Corp.	10/1/01	10,150,000,000
First City Bancorp. Of Texas	10/31/92	9,943,000,000
First Capital Holdings	5/30/91	9,675,000,000
Baldwin-United	9/26/83	9,383,000,000

* The Enron assets were taken from the 10-Q filed on 11/19/02.
Source: http://www.bankruptcydata.com/Research/15_Largest.htm

4.3 Priorities in Liquidation

If liquidation is the chosen course of action, the claims against the company (the liabilities) must be ranked in order of their legal strength, or priority. First come the so-called preferred claims, established by law; these consist of such items as all accrued taxes, back salaries, and the actual expenses of the receiver (especially the lawyer) and the bankruptcy proceedings. Second in priority come the holders of liabilities with liens (or mortgages) against specific assets. Whatever funds these assets bring in are applied first to these "sheltered" claims; afterwards any unsatisfied portion of the sheltered claim shares equally with the rest of the general creditors. Thus, having a specific lien or pledge or mortgage does not always protect the holder from loss. The protected claims, however, usually fare better than the general creditors, and they can never do worse. After the various protected claims come the general creditors who share pro rata in the rest of the funds made available by liquidation. Following the debt holders come the preferred stockholders, if any. If, as rarely happens, anything is left over, it goes to the common stockholders.

Table 4 illustrates the settlement of liabilities (after the preference claims have been paid) under different circumstances. Following the rules of allocation, it indicates how the final settlement for each class of liabilities was calculated. Note that the book value of the assets as such had no bearing on the settlements. The accrued interest takes on the same legal priority as the principal of the claim to which it is attached.

Table 4. Settling Claims in Liquidation under Varying Circumstances

Case 1

	Book Value of Assets	Liquidation Proceeds
Fixed Assets	$1,000,000	$ 424,000
Current Assets	2,000,000	1,500,000
Total	$3,000,000	$1,924,000

Liabilities	Principal	Accrued Interest or Dividends	Total Claims Presented	Settlement	Percent of Claim
First Mortgage Bonds (on Fixed Assets)	$ 300,000	$ 6,000	$ 306,000	$ 306,000	100.0%
Second Mortgage Bonds (on Fixed Assets)	300,000	18,000	318,000	268,000	84.3
General Creditors	1,800,000		1,800,000	1,350,000	75.0
Preferred Stock	500,000	100,000	600,000	0	0.0
Common Stock (Book Value)	1,000,000	0	1,000,000	0	0.0
			$4,024,000	$1,924,000	

Case 2

Liquidation Value of Assets

Fixed Assets	$1,500,000
Current Assets	3,000,000
Available Funds	$4,500,000

Liabilities	Claims Presented	Settlement	Percent of Claim
First Mortgage Bonds (on Fixed Assets)	$3,000,000	$2,250,000	75.0%
Second Mortgage Bonds (on Fixed Assets)	500,000	250,000	50.0
General Creditors	4,000,000	2,000,000	50.0
Common Stock	5,000,000	0	0
	$12,500,000	$4,500,000	

Case 3

Liquidation Value of Assets

Fixed Assets	$2,000,000
Current Assets	5,000,000
	$7,000,000

Liabilities	Claims Presented	Settlement	Percent of Claim
First Mortgage Bonds (on Fixed Assets)	$3,000,000	$3,000,000	100.0%
General Creditors	3,500,000	3,500,000	100.0
Preferred Stock (1,000,000 + 100,000 accumulated dividends)	1,100,000	500,000	45.5
Common Stock	8,000,000	0	0.0
		$7,000,000	

Liquidations follow the doctrine of absolute priority; i.e., no junior claim is allocated any funds until all the claims senior to it have had their legal due.[6]

4.4 Reorganization

If the reasonably capitalized value of the firm's cash flow is greater than the liquidation value of the assets, reorganization is the preferable remedy. The purpose of a reorganization is to trim down the existing claims so that the projected cash flow of the bankrupt firm can support its new financial structure. Sometimes, after passing through a reorganization, a firm's operations have taken a favorable turn, and it has moved on to economic success.

The reorganization plan is hammered out by the representatives of all the classes of claimants with the guidance of the SEC or the ICC. It must be passed by a vote of two-thirds of all classes of claims and approved by the court. When all this is accomplished, the reorganized firm is discharged from bankruptcy. Because of the legal intricacies involved, sometimes it may take years for a firm to be discharged from bankruptcy. Improving economic conditions may encourage a junior class of security holders to delay the final reorganization in hopes that the eventual settlement will be more favorable to them. In the meantime, the trustees run the firm, collecting revenues, paying currently incurred obligations, and perhaps servicing old debt that has a strong legal and financial position.

Bankruptcy implies losses for someone. How these losses are to be apportioned is the problem. The doctrine of absolute priority (APR) is followed in liquidation. This doctrine is the also basic rule, reiterated by the Supreme Court,[7] in reorganization. In other words, no value is to be passed on to any junior claim if any class of superior claims has suffered deterioration in the exchange of securities proposed in the reorganization.

In a recent study of 300 cases from the Arizona and New York federal bankruptcy courts from 1995 to 2001, Bris, Welch, and Zhu (2006) found that Chapter 7 liquidations offered few advantages relative to Chapter 11 reorganizations. The Chapter 7 liquidations took almost as long a time to resolve, cost almost as much in fees, and provided creditors with lower recovery rates than Chapter 11 liquidations. Bris, Welch, and Zhu found Chapter 7 firms had lower pre-bankruptcy assets than the corresponding Chapter 11 cases; had less equity owned by managers; and more unsecured debt than Chapter 11 firms. The mean number of days in bankruptcy exceeded 70 days for both Chapter 7 and 11 firms, with larger bankruptcies taking longer to resolve, and bankruptcy costs (expenses divided by pre-bankruptcy assets) were approximately 8% for Chapter 7 cases and 17% for Chapter 11 cases. The greater the number of creditors, then the lower is the unsecured recovery rate. Bris, Welch, and Zhu also found that APR tends to be violated when there are fewer secured creditors, when secured creditors own a larger fraction of total debt, and the larger the debt.

A rival to the doctrine of absolute priority is that of relative priority. A reorganization following the lines of relative priority would be considered fair as long as the losses apportioned to each claim were smaller for those of higher senior position. The first mortgage bonds might accept an adjustment in their claims representing an economic loss of 10 per cent, the second mortgage bonds 30 per cent, the general creditors 50 per cent, and the equity holders 90 per cent. (Under absolute priority the claims of the first mortgage bonds would have been satisfied in full, and the stockholders would have received nothing as long as the general creditors suffered any loss. Whether or not the second mortgage holders would suffer any loss would depend on the estimate of the value of their specific lien.)

The theory of "joint venturers" has been promulgated in support of the doctrine of relative priority. The notion is that all the investors in a business are together in a risky enterprise. If the firm founders, some may lose more than others, but they should all make sacrifices to get the company afloat again. However note that if the initial venture is successful, the debt holders will receive a limited return and all the extra rewards would go to the stockholders. The advocacy of relative priority seems to rest on a certain sympathy to the shareholders – possibly deriving out of some image of the poor farm girl and the rich mortgage holder. In truth, in the modern corporation generally the shareholders are risk-takers, "men-of-the-world," and the bondholders are mostly pension funds, insurance companies, or trustees, representing basically the holdings of the aged or funds designed for the support of widows and orphans.

An obvious objection to relative priority is that there are an infinite number of solutions within its framework. It becomes quite difficult for any court to decide whether the proposed plan calls for an excessive sacrifice on the part of the senior creditors.

Although absolute priority is, no doubt rightly, the basic rule of law, a small amount of relative priority tends to creep into most approved reorganizations. If a firm has a complicated financial structure, the protective liens may be quite entangled; for example, a railroad bond which has a first mortgage on one section of track might have a second mortgage on another part of the roadbed and possibly even a third lien over another part of the road. It may be easier in such cases to make some compromises of conflicting claims than to try to make a sure determination of which has the highest priority. Another difficulty arises out of the politics of the reorganization proceeding itself; the junior security holders are often in a strategic position to delay the approval of the plan if they do not obtain some concessions. Furthermore, the trustees in bankruptcy are often recruited from the ranks of the old management, and their latent sympathies may lie with the stockholders. Last, reorganizations often take place during the lows of the business cycle. The courts during such a period may fear that the projected cash flows may be set at too pessimistic a level. Rather than cut off any claim completely, they prefer to give the junior claimants contingent values, such as warrants which can be exercised profitably if the company makes any recovery of earning power and its new shares rise on the market.[8]

Through the issue of warrants, junior claimants might recoup part of their losses. It should be acknowledged, however, that the existence of the warrants constitutes a drag on the potential appreciation of the shares that may have been given out during the reorganization as part settlement of senior claims. The warrants, then, delay the rate at which the higher priority claimants recover their losses.

The following analysis, found in Table 5, illustrates the problems involved in setting up a reorganization plan. This plan could possibly be rejected by the court; it contains some amount of relative priority.

Table 5. Analysis of a Hypothetical Reorganization Plan of the Hardnox Corporation

1. If existing economic conditions were not to improve significantly, the earnings of the Hardnox Corporation were conservatively expected to aver age about \$1,100,000 per annum before depreciation (on the old base), interest, and taxes. Because of back losses and high depreciation, the company would not have to pay taxes on this section of the cash flow for fifteen years. This level of cash flow on the existing plant should prevail for about fifteen years with future returns running somewhat lower.
2. The liquidation value of the Hardnox Corporation was appraised at about \$4,000,000.
3. If the cash flow of the firm is conservatively capitalized at 10 per cent for fifteen years, the going concern value of Hardnox is a minimum of \$8,367,000 (\$1,100,000 $a_{15/10\%}$) against a liquidation value of \$4,000,000. Reorganization is therefore clearly advantageous.

Financial Structure before Reorganization*

Ranking Claims	Principal	Accrued Interest
1st Mortgage Bonds (30 years partial sinking fund 1% annually) 4%	\$10,000,000	\$1,000,000
Debentures 5's	16,000,000	2,000,000
Common Stock (200,000's at \$100 par value)	20,000,000	0

* All the general creditors representing small or preferred claims were settled by the trustee in bankruptcy.

The proposed reorganization:

1. The senior bondholders to receive new \$100 par value common stock for the accrued interest of \$1,000,000, leaving the principal of the bonds intact. (Total distributed: \$10,000,000 bonds, and \$1,000,000 common.)
2. The debenture holders to receive \$500 worth of 4 per cent pfd. and \$625 par value of common representing the rest of the principal and accrued interest. (Total distributed: \$8,000,000 pfd. and \$10,000,000 common.)
3. The common stockholders to receive 1 share of common for every 10 they now held. (Total distributed: \$2,000,000 par value common.)

Projected Reorganization
Capital Structure

1st Mortgage Bonds (Unchanged) 4's	\$10,000,000
Pfd. Stock 4%	8,000,000
Common Stock (130,000's)	13,000,000

Analysis of the Plan

A. Feasibility

Prior and Fixed Charges

	Before Reorganization	After Reorganization
Fixed (Interest)	1,200,000	400,000
Contingent	0	320,000
Total	1,200,000	720,000
Sinking Fund Installment	100,000	100,000
Cash Requirements	1,300,000	820,000

If the cash flow runs slightly over $1,000,000 a year, the prior charges on the new financial structure will be met readily. The margin for the repayment of the principal on the bonds in the early years is not great, but if the worst should occur, dividends may be passed on the preferred. Of course, as the bonds are gradually repaid, the bond interest charges drop. If economic conditions improve, some funds may be available to improve the value of the common.

B. Fairness

Projected Operating Statement

EBITD	1,100,000
(Estimated True Depreciation)*	120,000
	980,000
Interest	400,000
	580,000
Preferred Dividends	320,000
Earnings on Common	260,000
Earnings per Common Share	$2.00

*For tax purposes depreciation would be kept on the original cost base of the fixed assets. If the ready market value of the fixed plant were $1,800,000, the depreciation on the present investment on a straight line basis would be $120,000 per annum.

Analysis of the Re-organization

1. The maximum likely market value of the new common shares would be $20, representing a price/earnings ratio of ten.
2. The bondholders would get back most of their principal value in the form of their present contract. However, for their accrued interest amounting to $100 a bond, they would receive a share of common having a value at best of $20. Therefore, for each $1,100 value of claim, the bondholders would get back securities worth $1,020 or 92.7 per cent of their claim.
3. The preferred stock given to the debenture holders has contingent claim against dividends rather than a fixed claim; moreover, it carries only a 4 percent dividend against the previous 5 per cent on the debentures. It is dubious if the preferred has a value of over $60 per share. Thus, the debenture holders would receive securities valued at $300 worth of preferred and $125 worth of common for each $1,125 of principal and accrued interest or a settlement of 37.8 per cent.

4. For each $1,000 par value of old common, the shareholders are to get one share of common having a maximum value of $20, or a nominal settlement of 2 per cent. From an aggregate point of view, however, they receive securities having an approximate value of $400,000. This would make up part of the loss suffered by the bondholders or debenture holders.
5. Conclusion: the proposed reorganization plan has a considerable element of relative priority. It is a moot question whether it would pass the scrutiny of the courts.

In practice reorganization procedures are likely to be even more complex than those shown for the hypothetical Hardnox Corporation. Each class of claimants appoints a protective committee and many proposals are argued back and forth. Nevertheless, the illustration of the Hardnox Corporation case demonstrates most of the essential steps of a corporate reorganization:

1. First it is determined whether the positive cash How of the firm makes reorganization worthwhile.
2. All the claims are assembled and ranked in order of their priority.
3. New securities are proposed to be exchanged for the old claims.
4. Many of the new securities will be given a contingent or variable claim (income bonds, preferred stock, or common stock) in place of the fixed return securities they replace. (A strongly secured senior security may be left entirely untouched.)
5. The object of the reorganization is to reduce the fixed charges and debt of the firm so that it can meet its remaining obligations out of its projected cash flow. (This constitutes the overriding test of "feasibility.")
6. The values remaining in the firm must be divided according to the priority of the claimants. This constitutes the test of legal fairness.
7. If the reorganization is successful the firm should not fail again, at least in the near future.

5. SUMMARY

From the viewpoint of the various investors any reorganization is a necessary, unpleasant financial surgery. It distributes losses among the classes of claimants. But the reorganization in itself did not cause loss; it is only a recognition of the economic deterioration that has already occurred. The object of a reorganization is to tailor the financial structure of the firm to fit the going concern value of the remaining earnings.

Notes

[1]The Dunn & Bradstreet (D&B) data is used in this chapter. However, the D&B data is not included in the economic report of the President after 1998. A second source of data is the American Bankruptcy Institute, ABI, which carries a 1980-2002 series on its website. The business bankruptcy filings on the ABI database for the 1998-2002 period are:

Year	Business Filings
1998	44,367
1999	37,884
2000	35,472
2001	40,099
2002	38,540

The decline in filings may be surprising given the stock market performance of the period. Source: www.abiworld.org.

[2]Sometimes a firm's shares sell on the market consistently below their liquidation value. This indicates that the net liquidating asset value of the firm is greater than its value as a going concern. Of course, the inside holders or the management may strongly resist any proposal to liquidate.

[3]For example, the, Adams Express Company and Berkshire Hathaway are companies which have been turned from operating firms into investment companies.

[4]Furthermore, under the present tax loss carry-forward provision, Company B would probably not have to pay any profits tax for some time.

[5]Failure, of course, should not be confused with an occasional slow payment on a bill or statement.

[6]A lawyer friend of one of the authors told us that in the world of business, it is b not uncommon for a subordinated debt holder to threaten to hold up settlement. In such cases, it may be in the best interests to make a partial payment to the junior debtholders (claims) and allow settlement to proceed.

[7]Case v. Los Angeles Lumber Products Co., 308 U.S. 106 (1939).

[8]Warrants are options to purchase shares at a fixed price. If a warrant carries an option price of $15, and the shares have a market value of $10, the warrant has little intrinsic value. If the shares should rise above $15, however, the warrants are worth at least the difference between $15 and the share price. Actually, because of their speculative leverage, warrants tend to sell somewhat above their intrinsic value.

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Problems

I. The XYZ Corporation was bankrupt. It was decided to liquidate the firm. The following claims were presented:

1st Mortgage Bonds (on fixed assets)		$1,500,000
2nd Mortgage Bonds (on fixed assets)		500,000
General Creditors		1,000,000
Preferred Stock	$1,000,000	
Plus: Accrued Dividend	500,000	1,500,000
Common Stock	5,000,000	
Less: Deficit	(2,000,000)	3,000,000
Total		7,500,000

How much would each class of claimant get on the dollar?

a. If the fixed assets were liquidated for $1,800,000, and the other assets brought in $600,000?

b. If the fixed assets brought in $1,000,000, and the other assets brought in $1,000,000?

c. If the fixed assets were liquidated for $1,500,000, and the general assets brought in $2,000,000?

II. The ABC Corporation shows the following balance sheet:

Assets	$15,000,000	Current Liabilities	3,000,000
		Bonds 5%	7,000,000
		Equity	5,000,000
	$15,000,000	Total	15,000,000

It was estimated that an EBITD averaging about $325,000 was likely to last about 20 years before extensive replacements would be needed in the plant (depreciation: $20,000). Taxes were likely to be nil for some time. Liquidation value, $5,000,000.

a. From the accounting point of view, what are the net profits of the firm?
b. Should this firm be liquidated or reorganized? Quantify, and explain.

Chapter 20

CORPORATION GROWTH AND ECONOMIC GROWTH AND STABILITY

Economic growth is usually defined as the rise in total measurable economic output over a given period, i.e.; such as in the growth in real GDP modeled in Chapters 12 and 13. This is a definition of gross growth. However, if the population increases significantly in the same period, output per capita may remain constant or even decline. The average citizen of the country is no better off than before, and thus in one very relevant sense no economic growth has taken place. A net concept of growth (closer to welfare criteria) can be developed by using the increase in average output per capita. Another problem of measuring growth arises if the society shows a desire for an increase in leisure. If average output does not decline while the work week shortens and vacations lengthen, growth has taken place although its fruits have been absorbed as an increase in leisure. Growth is difficult to discover between the dips and rises of the business cycle. The national per capita output at a peak period may appear to have grown very rapidly compared to that of a preceding recession in business activity. Actually the potential output of the recession period, the output possible were the economy operating at capacity, might be relatively high. Growth should thus be measured from one equilibrium period to another, or, if possible, measured in terms of increases in potential capacity product per capita. If a nation's economy falls significantly from its capacity, the problem is essentially one of economic stability and not of economic growth.[1]

1. FACTORS IN ECONOMIC GROWTH

Even if precise measurement is not entirely possible, it can be agreed that economic growth takes place when the potential product of the economy rises sufficiently to allow an increase in the real income per capita. Two factors contribute to a rise in average real income[2] – real capital formation, and an increase in the skills of a society, that is an increase in human capital.

Capital formation is a net increase in the amount of tools, buildings, machinery, stocks of goods, soil drainage projects, port improvements, and other such facilities available to the community. The government may provide capital formation in the form of roads, dams, bridges, public buildings, schools, parks, and other similar items. Educational institutions and foundations may provide new capital in the form of classrooms, laboratories and hospitals. The major contribution to capital formation by individuals is mostly in the form of house construction. In a modern economy a large area of net capital formation derives from private business whose dominant form is the corporation. Whenever a company invests in new plant or equipment, increases the capacity or efficiency of old plants, builds up inventories, or in any way increases the productive potential of itself and the aggregate economy, it adds to the output capacity, the growth of the economy. Private capital formation or real investment is a dynamic element in our economic system. Most economists consider its behavior the major key to understanding the problems of economic stability and economic growth.

The other element making for economic growth – an increase in the skills of a society (human capital) – is less tangible than physical capital formation. An improvement in productive organization, in communicative ability, in manual or physical dexterity, and the development of new processes can add to the productive potential of a society, even if the total physical capital remains constant. Possibly an increase in the skills and techniques of the population could be subsumed into the general category of capital formation. Resources can be estimated in physical capital, and / or in human capital. The director of an economic program in an under-developed nation may have to decide whether to use some of his funds to send more of his people away for education and training or whether to build a fish-freezing plant.[3] City fathers may have to decide between a higher school budget or improved storm sewers, and the finance officer of a corporation may have to choose between a new milling machine or a bigger research program.[4]

1.1 Savings and Real Investment

Economic growth is made possible only if there is an increase in usable equipment in the society and/or an improvement of the skills and techniques of the populace. If the economy is operating near its capacity, the resources necessary for capital formation or for training programs must come either out of the country's own current production, or from the current production of another country in the form of a loan or bridging grant. From a global view, the quantity of goods and services available to mankind is relatively scanty, and the amount of product that can be diverted from current consumption to capital formation of all kinds is not as abundant as one might wish. Yet capital can be made available to society only through voluntary savings or through compelling a decreased production of consumer goods. Thus the classical economists, viewing humanity's material progress historically, did not err in emphasizing the importance of saving in the improvement of mankind's economic environment. The modern emphasis is, however, on the act of real investment itself. Capital formation may slacken not from a lack of savings, but from a lack of profit-making opportunities or dynamic push on the part of the sectors of the economy that make investment decisions.

In summary, nations must rely on increased capital and improved technology for a sustained increase in income. Sacrifice of total possible current consumption can help provide savings to build new plants and machinery. Research may increase its soil fertility, and countries can build dams to irrigate dry areas and provide power. Governments can build schools and train its people, providing the seed bed for a more advanced economy. If the growth of capital exceeds the growth of population and the decline of natural resources, the economy may continue to return an increases in per capita income to its members. If, however, the rate of population growth exceeds the rate of provision of new capital or if the rate of capital growth and inventory is insufficient to make up the loss of natural resources, per capita real income will decline.

A high rate of savings is not a sufficient condition to insure capital growth. Especially in a rich economy, entrepreneurs and investors may be unwilling to engage in capital formation during periods when the demand for finished products is slack. Thus a growing rate of consumption and individual expenditures may be as necessary for the continuous formation of capital as the passive act of saving, which releases productive resources. The English economist, John Maynard Keynes, held that in normal times a rich economy is more than likely to provide enough savings (or nonconsumption) to enable capital growth to take place. [Weintraub (1978)]. The major problem may be to provide enough consumption expenditures and other incentives to insure that sufficient active investment takes place to employ the amount that is saved.

1.2 Corporation Investment Spending and Economic Stability

Capital formation is necessary for sustaining economic progress. It is also needed to maintain full employment. According to national income theory, if the amount of investment undertaken is not large enough to offset the amount of money that would be saved at the full employment income level, output and income slides off and the aggregate economy reaches equilibrium at something less than full employment of labor and other resources.[5] The fiscal and monetary authorities in the government may then initiate various policies to attempt to offset the inadequacy of investment spending, but it is clear that the level of business investment spending in a free enterprise economy is a crucial variable in determining the level of national income and employment.[6]

The capital markets play a most important role in mobilizing consumer savings and allocating them to investment uses. The sale of new securities on the primary capital market taps personal savings and funnels them into capital formation. Even though a good deal of corporation investment is internally financed by business savings (retained earnings and current depreciation charges), the new funds provided by individuals (either directly, or indirectly through financial institutions) add a dynamic thrust to the economy. These funds add to the potential growth of existing companies and allow for the formation of new competitive companies. However, dealers and traders must operate fairly, and the managements of corporations must be mindful of the interests of their security holders if the capital markets are to function properly. For if the ordinary investor doubts the fairness of the treatment he will receive if he puts his savings into corporation securities, the flow of savings into the capital markets will surely slow down, the cost of risk capital will rise, and there will be a brake on the rate of economic development.

In the United States, the corporation is a major catalyst in private capital formation. As shown in Table 1, in 2002 gross private investment in the United States totaled \$1622.4 billion. Of this amount \$1185.3 billion or 73.1 per cent was initiated by business enterprises. The factors influencing the amount of business investment are complex. The volume and trend of consumer spending, the trend of prices, the costs and risks of obtaining capital, and the optimism or pessimism of entrepreneurs and managers who forecast future demand affect investment decisions.

The forecast of anticipated future returns has more effect in determining new investment than the volume of current profits. Sometimes it is assumed that if firms have high current earnings, they necessarily invest because they have the funds to do so. This assumption confuses the total amount of retained earnings with business investment spending. Retained earnings are more fruitfully regarded as business savings rather than investment. When funds generated internally are used to purchase

Table 1. Business Contributions to Gross Private Capital Exp. ($ 1996 billion)

	Real GDP (in billions)	Real Gross Private Domestic Investment	Business Investment	Percent Private Business of Total Investment	Percent Private Business Investment/GDP
1947	1524.3	191.5	110.7	57.8%	12.6%
1950	1763.9	271.8	121.6	44.7	15.4
1960	2369.3	239.5	149.9	62.6	10.1
1970	3587.3	421.0	273.3	64.9	11.7
1980	4986.3	662.2	469.4	70.9	13.3
1990	6713.3	849.6	632.4	74.4	12.7
2000	9274.0	1755.2	1329.9	75.8	18.9
2002	9512.1	1622.4	1185.3	73.1	17.1

Source: U.S. Department of Commerce, Bureau of Economic Analysis, http://reserch.stlouisfed.org/fed/data/gdp

new productive assets, the firm's savings are offset by capital spending. But if corporate managements generally are pessimistic as to future earnings, they may develop a high "liquidity preference." That is, they may keep a larger proportion of the firm's assets in cash, building up liquid holdings from their current funds flow. If increased spending in other sectors of the economy does not offset this development, the level of economic activity will decline.

On the other hand, if business pessimism can lead to a downturn in economic activity, an aggressive investment policy can contribute to inflation. When the aggregate demand for goods and services is strong, businessmen can create additional effective demand by borrowing funds or drawing down liquid balances and spending on equipment or inventory. This extra demand (financed by an increase in credit, or an increase in the velocity of money circulation, or both) pushes the price level upward. However, seldom does this type of demand inflation become severe or dangerous. It can be curbed by effective monetary measures, or eventually comes to a halt itself if the central monetary authorities create no net new bank reserves.[7] Runaway or hyperinflations seem to occur only when the fiscal responsibility or financial power of the central government breaks down and it can find no source of funds other than to print money or create monetary credit. At some point in this process, the public loses confidence that the official money will ever have any scarcity value. The runaway inflation begins.

2. MONETARY POLICY, THE COST OF CAPITAL, AND THE FIRM INVESTMENT PROCESS

The firm's decision to invest in real assets is determined by the anticipated income possibilities on the one hand, and on the other by the cost and availability of funds. What constitutes the cost of funds is a complex matter. Setting the base for the cost structure is the going level of the pure, nonrisk, interest rate. Rising from this are the rates that borrowers of increasing risk position have to pay. Finally there is the cost of equity funds, influenced by the interest rate, the risk premium, and, very heavily, by anticipations.[8] The economic feasibility of investment projects is determined by matching the prospective returns against the costs of the capital mix, including the allowances for risks and uncertainties.

Expansion projects are undertaken when their probable profitability exceeds the cost of capital; thus the aggregate amount of investment should increase if the cost of capital decreases. At any given level of anticipations, the volume of investment activity is an inverse function of the basic interest rate, assuming the level of the interest rate helps determine capital costs.[9] (The proportion of increased investment is determined by the elasticity of the investment function to changes in the interest rate.) The possible influence on the volume of investment spending is the rationale for monetary policy. The monetary authorities, by stimulating the money supply and moving the interest rate downward, can hope to stimulate investment and consumption spending. This should lead to a higher level of economic activity. Conversely, holding down monetary growth can lead to a rise in the interest rate , which can be used to dampen an inflationary rise in spending.

According to Keynesian economists if the economy's reaction to monetary. policy is not strong enough, the tools of fiscal policy may be used. The government may intervene directly in the income flow of the economy by spending more than it takes in revenue during a recession in business activity, or by running a surplus during an inflationary period. [Weintraub (1978)]. Anti-recessionary policy can be initiated by cutting taxes, allowing tax revenues to drop, or by increasing government expenditures. Most economists generally agree that fiscal policy should at least be implemented if an economic downturn is sufficiently prolonged and severe.[10]

In contrast to advocates of fiscal policy and/or discretionary Central Bank policies, the monetarists led by Milton Friedman (1972) argue that a reasonably competitive market economy is inherently stable, under the proper financial condition. They argue for a stable forecasted quantity of the money supply as the necessary condition for economic stability. Equilibrating movements of the interest rates, saving and investment will take place in the market.

3. ECONOMIC GROWTH AND FIRM GROWTH

The analysis of growth, both aggregate and that of the firm, has not been completely assimilated into the general corpus of macroeconomic theory, Price theory, although a fascinating subject in its own right, is traditionally set the task of solving the economic relations of output and price with a given set of tastes, usable resources, technology, population, and political, social, and economic institutions. Price theory is most concerned with equilibrium states and the movement from one such state to another. Growth, on the other hand, is a process of continuous disequilibrium.

Growth occurs when demand increases or production functions change. Under these two categories we can classify shifts in population, tastes, income patterns, and innovations – new products, new techniques, or improved organization. In a free enterprise economy, adjustment to these changes is rewarded by increased returns. Producing to meet an increased demand brings profits; adopting a successful innovation brings profits. Striving to obtain these profits, the entrepreneurs seek out and cajole more capital into the potentially profitable activities. The result is capital formation and growth.

4. FIRM GROWTH AND ECONOMIC GROWTH

All instances of aggregate growth do not necessarily beget the growth of the individual firms. For example, assume an industry conforming to the purely competitive model, with free entry, with firms already at the optimum size, and with perfect knowledge, including knowledge of the production function. Since all the firms know they are at the long-run optimum size, an increase in product demand does bring about growth of the industry by the entry of new firms but not by the growth in the size of individual firms.[11] On the other hand, the economic model will show firm growth if the equilibrium is upset by an innovation which changes the optimum scale of production. The first firm to introduce the change and increase its capacity would show profits. To obtain their share of the returns or to prevent losses other firms would imitate the innovation.

Since in most industries firms are of disparate size, it must be assumed that complex dynamic factors are at work and that imperfections and frictions hinder a perfectly smooth competitive adjustment. As a matter of fact, Professor Joseph Schumpeter emphasized the need for some competitive imperfections in encouraging economic growth. [Schumpeter (1989)]. If there were no imperfections or frictions in the competitive structure – no hurdles to entry, for example – a firm adopting an innovation would enjoy its profits for only a brief time. The entrepreneur who initiates an innovation must anticipate a reasonable period of economic advantage if the time, effort, and risk of working up new products, techniques, or expansion projects are to be justified.[12] However, although some competitive imperfection encourages research, development, invention, and innovation, too much tends to hinder widespread adoption of new improvements.

Once the pervasive frictions and imperfections of the real world enter the model, we have forces sheltering the individual firm which grows to meet an increase in demand.[13] Different firms in the same industry may not have the same optimum size. They differ in location, history, in the quality of the productive factors available to them; they may use different production techniques, and so they may differ in size. Moreover, in a dynamic society, a constant stream of improvements in communications skills, in organization and administration, and the increase in the engineering efficiency of large productive units tends continually to change the optimal scale of output. Thus the pull of demand and the push of technological change may coincide to produce company growth.

Not all company growth is a response to increases in demand. Firm growth may be motivated by the power or status drives of management rather than by economic considerations. Expansion may be an attempt to acquire market dominance. These types of company growth do not necessarily increase general economic welfare. Not all the elements of a firm's environment favor expansion. Even if the forecasted profits seem substantial, management may reasonably fear the unknown, especially if the firm lacks experience in the new activity. Furthermore, in a dynamic environment the possibility of future competition must be considered. Management may think twice if the present company is profitable and the new project is risky and entails a heavy commitment of fixed costs. However, the rate of future growth may have to be carefully controlled if increases in size are not to raise the cost structure disproportionately. A firm that expands too rapidly may find that its operating and financial structures have become inflexible. A company can be too big, unwieldy, and difficult to manage.

If a company expands by acquiring the already existing facilities or assets of another company through merger, combination, or purchase, the aggregate capacity of the economy has not increased. Corporate expansion can be counted as a net addition to national economic capital formation only when it brings into being new real assets or facilities.

From the viewpoint of macro-economic analysis, corporation expansion which increases aggregate net investment coincides with either an increase in corporation retained earnings or an increase in the supply of financial assets held by the public. That is, either the book value of stocks increases, or new bonds or stocks are floated; if the banking system financed the expansion, the money supply increases. (The organization of a new corporation using new assets also increases the financial holdings of the economy.) Company growth which is also economic growth either taps business savings, the community's pool of personal savings, or it creates an increase in monetary assets. On the other hand, a firm that expands by acquiring the assets of another company adds nothing to the net financial holdings of the economy, since all that is involved is an exchange of various financial assets.

Notes

[1]One suggested index of growth is the average product per man hour. This allows for variations in employment and working hours and does a fair job of reflecting growth in potential output.

[2]An increase in leisure may be considered a rise in real income or product.

[3]Of course, education is more than a capital investment in human skills. Insofar as it pleasures the spirit, it is also a consumer good.

[4]Although the important role of the private corporation in the formation of capital is clear, less obvious is the part that industry plays in developing the skills of society. Not only are there formal training programs and research, there is a continual "learning on the job," and most importantly inculcating industrial discipline. The crucial significance for economic progress of an understanding and disciplined labor force is evident to economists who have worked in under-developed areas.

[5]The income theory given here is of course highly simplified.

[6]The responsibility of the government toward maintaining a reasonable level of employment in the economy is not clear-cut. However, passage of the Employment Act in 1946 and subsequent political developments indicate an implicit commitment to the use of stabilizing policies if the economy should veer too sharply from full employment.

[7]Two factors restrain this type of inflation: 1. As more bank credit is utilized, the interest rate rises. This rise in credit costs dampens the net profitability of many projects; 2. As the aggregate price level rises, the increase in the individual firm's dollar volume calls for an increased cash balance to carry the larger amount of sales safely. At this point, the firm's cash balance no longer seems excessive, and the firm is no longer willing to draw down its cash for other assets. When spending units in the aggregate find themselves with minimum cash "transaction" balances, no further increase in the velocity of the circulation of money is likely to take place.

[8]Estimating the cost of equity funds for new entrants is especially difficult because the supply of ownership funds may be discontinuous. The new entrepreneur may be able to raise a certain amount of capital at risk and then find no further amount available.

[9] Assuming a declining rate of return for successive increments of real capital investment, Keynesian theory constructs the schedule of the marginal efficiency of capital. This hypothetical function gives the amount of aggregate capital investment at various interest rates.

[10]See *Managing Our Money, Our Budget, and Our Debt*, by the President's Cabinet Committee on Price Stability for Economic Growth, U .S. Government Printing Office, October 1959, for a «moderate" approach to fiscal policy.

[11]If we have a perfectly competitive model with imperfect knowledge, i.e., if the firms do not know they are at the lowest cost point for the long run, some may expand in response to increased profits. Those that do so may later suffer losses as new low-cost producers enter the industry.

[12]Thus in a highly competitive industry, research may have to be publicly sponsored. In agriculture, major technological improvements appear to be initiated and disseminated mainly by the various federal agencies, state research and extension services, and the agricultural research activities of state universities and colleges.

[13]It is also possible for an innovation to decrease the scale of operation. In this case firms might shrink in size, and yet the productive potential of the economy would still grow.

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Problems

1. Present the United States G.D.P. per annum from 1950 to date. (You may show this in a graph or in tabular form.) What is the average growth rate over this period?
2. Deflate the G.D .P .for price level changes and growth in population. What is the growth rate on this basis?
3. Choose an industrial firm or a utility that has not engaged in any significant mergers or acquisitions. Using total assets as a rough measure, compare the firm's growth to that of the undeflated G.D.P.

Chapter 21

INTERNATIONAL BUSINESS FINANCE

With the adoption of flexible exchange rates in 1973, international capital markets have become more completely integrated. This chapter discusses portfolio selection of international equities, and how international diversification lowers total risk of portfolios. Particular attention is paid to the diversification implications of Asian stocks, other emerging markets, and Latin American securities. The US equity selection model developed and estimated in Chapter 14 is used to rank global (ex-US) securities, and produces statistically significant information coefficients and excess returns. An investor owns foreign stocks because their inclusion into portfolios produces higher Sharpe ratios than using only domestic securities. Global and (domestic) US securities may produce portfolios of higher returns for a given level of risk.

1. CURRENCY EXCHANGE RATES

One of the additional risks affecting the returns on foreign investment is the possible movement of the exchange rate. The following data would be of interest to a US investor on August 26, 2003:

$1 US = .635 £ (Pound)
$1 US = 117.3 ¥ (Yen)
$1 US = .917 € (Euro)
$1 US = $1.399 C (Canadian)

What do these exchange rates mean? Let us take a trivial, but interesting example. A US investor can ride the subway in New York City for $2.00. The US investor can make a business trip to Montreal, Canada, and ride the subway for $2.50 C (Canadian). Which ride is more expensive? The $2.50 Canadian subway ride in Montreal costs the US investor $1.788 US ($2.50 x .715, or 1/$1.399). The Canadian subway system is cheaper (and cleaner) than the US system, despite its seemingly higher cost. Let's take another example. I can purchase a Honda Odyssey minivan for $25,000 in the US. If the Honda minivan is priced at $35,000 C, should our US investor take his cheaper subway ride and buy the vehicle in Montreal? The $35,000 C car would cost the US investor $25,025 US in Montreal. The US investor should pay the $25,000 domestic cost. If the Honda Odyssey cost 3,500,000 Yen in Tokyo, should the investor purchase the vehicle in Japan? The 3,500,000 Yen cost represents a price of $29,750 US (3,500,000 x .0085, or 1/117.3). The US investor should purchase his Japanese car in the US, rather than Canada or Japan.

A more traditional key cross currency rates matrix is normally presented as the following on June 22, 2005:

Currency	USD	EUR	JPY	GBP	CAD
USD	….	1.2128	.00919	1.8218	.8100
EUR	.8254	….	.00757	1.5021	.6679
JPY	108.86	132.03	….	198.33	88.185
CAD	1.2345	1.4972	1.1340	2.2490	…..
AUD	1.2841	1.5574	1.1795	2.3394	1.0402

where USD=US Dollar,
EUR=Euro.
JPY=Japanese Yen,
GBP=British Pound,
CAD=Canadian Dollar.
Source: Bloomberg, L.P.

The US dollar fell from 117.3 yen in 2003 to only 108.86 yen in 2005. The US continued to run persistent balance of trade deficits that led to its continued currency depreciation. The US dollar depreciated versus the Euro, falling from 0.917 in 2003 to only 0.8254 in 2005.[1]

Economists have long held that in the flexible exchange rate regime in which we live, that the purchasing power of currencies should be equated by changing currency rates. That is, if a basket of commodities is cheaper in the US than in Europe, then US exports should rise, US imports fall, and the US dollar should rise (appreciate) such that the purchasing power of the US dollar and Euro are equal. The purchasing power parity theory (PPPT), put forth by Cassel (1916), holds that:

$$dE_x = \frac{P_{US_1} / P_{US_0}}{P_{\in 1} / P_{\in_0}} \tag{1}$$

where dE_x = change in exchange rate,
P_{US_1} = domestic (US) price level at time 1,
P_{US_0} = domestic (US) price level at time 0,
$P_{\in_1}$ = Foreign (Euro) price level at time 1,
$P_{\in_0}$ = Foreign (Euro) price level at time 0.

The PPPT holds that the rate of change in exchange rates equals the rate of change in price levels, which, of course, equals the relative ratios of inflation rates. See Yeager (1976) for a complete PPPT analysis.

A topic related to the purchasing power parity theory is the interest rate parity theory (IRPT). One may note the relationship between the nominal interest rate and the expected rate of inflation (see Chapter 9). Interest rates rise as the expected inflation rate rises. Irving Fisher put forth the relationship between interest rates and inflation in his *Theory of Interest* (1911). The Fisher Effect can be stated in terms of the domestic interest rates:

$$\frac{P_{US_0}}{P_{US_1}} = \frac{1+r}{1+Rn} \tag{2}$$

where r is the real rate of interest, equaling the marginal productivity of capital (the increase in output, GDP, due to an increase in the capital stock). The Fisher Effect can be stated in terms of the domestic and foreign price levels and interest rates:

$$\frac{E_{x_f}}{E_{x_s}} = \frac{1+r_{f_0}}{1+r_{d_0}} \tag{3}$$

E_{x_f} = current forward exchange rate; i.e., € = \$1 US,

E_{x_s} = current spot exchange rate,

r_{d_0} = current domestic interest rate,

and r_{f_0} = current foreign interest rate.

An alternative means of showing interest rate parity is in terms of the premium on the forward. Let E_{x_f} be the three-month forward exchange rate in dollars per pound, £, and E_{x_s} be the spot (current) exchange rate in dollars per pound. The premium on the forward, p, is:

$$p = \frac{E_{x_f} - E_{x_s}}{E_{x_x}} \ . \tag{4}$$

If r_f is the short-term (3 months) interest rate in London, and r_d is the three-month interest rate in New York, then

$$1 + r_d = \frac{1}{E_{x_s}}(1 + r_f)E_{x_f} \tag{5}$$

Note that E_{x_f} / E_{x_s} = H_p. Interest rate parity holds that:

$$1 + r_d = (1 + p)(1 + r_f) \tag{6}$$

$$1 + r_d = 1 + p + r_f + pr_f$$

If p and r_f are small, then pr_f becomes almost zero, and

$$p = r_d - r_f \tag{7}$$

The forward premium on the pound can be expressed as a function of the excess of the domestic and foreign interest rates.

On August 26, 2003, the three month pound LIBOR (London interbank offered rate) was 3.5663 percent, whereas the US dollar LIBOR rate was 1.14 percent. The premium on the pound forward was:

$$p = \frac{1.5596 - 1.5733}{1.5733} = -.0087$$

where the spot price of the pound is \$1.5733 and the current December futures price of the pound is \$1.5596. The pound, on August 26, had a forward discount (a negative premium) because U.K. interest rates exceeded US interest rates. Is this forward discount consistent with interest rate differentials? Let us assume that the relevant three month rates are consistent for a fourth month, December. An investor could invest \$100 in a three month US dollar security and have an ending value of \$100.02. We calculated this terminal value by:

$$\$100 \text{ x } (1 + \frac{0.0114}{4}) = \$100.29.$$

An investor could invest \$100 in a pound sterling £ security and have a terminal wealth value of \$100.29, by

$$\$100 \text{ x } (1 + \frac{0.0357}{4}) \text{ x } \frac{\$1.5596}{\$1.5733} = \$100.21$$

The US investor will do better to invest in the US security than to invest in the U.K. security. The Interest Rate Parity Theory (IRPT) holds that differences in interest rates determine the forward discount on currency. Most empirical studies, summarized in Cumby and Obstfield (1984) and Levich (2001), hold that deviations exceeding 3 percent of IRPT are relatively small in number for the short-term eurocurrency market.

The spot price of the Euro was \$1.0850 on August 26, 2003, and the closing futures price for the December Euro was \$1.0847. Given the Euro LIBOR three-month rate was 2.1138 percent, and the US LIBOR rate was 1.01138 percent, one could calculate terminal wealth values for a US investor investing in a US dollar security:

$$\$100 \text{ x } (1 + \frac{.0114}{4}) = \$100.29$$

and a Euro dollar security:

$$\$100\, x\, \frac{\$1.0847}{\$1.0850}\, x\, (1 + \frac{.02114}{4}) = \$100.50$$

The US investor has a slightly higher final wealth investing in the three-month Euro security.

Marston (1995) put forth several reasons why interest rate differentials might become distorted. Banking officials can impose controls of bank interest rates and these controls can lead to distortions of IRPT. British government controls on resident capital outflows were eliminated in June 1979. Marston (1995) reported that the interest rate differentials between Euro sterling and British markets which averaged 1.50 percent during the flexible exchange rate period with controls, fell to -.03 for the July 1979-March 1991 period without controls. The average differential during a subset of the Bretton Woods period of fixed exchange rates (April 1961-April 1971) was 0.78 percent. The elimination of controls established a very close IRPT relationship between the Euro sterling and British markets. US controls, such as the Voluntary Foreign Credit Restraint Program, the Foreign Direct Investment Program, and the limitation placed on US CD rates, by the Federal Reserve with Regulation Q, led to a 1.33 percent interest rate differential between the Eurodollar and US (CD) markets during the 1966-December 1973 period. The post control interest rate differential during the 1974-March 1991 period was only 0.48 percent.

2. INTERNATIONAL DIVERSIFICATION

Why would US investors want to own foreign, or international stocks? First, one can achieve additional diversification by owning foreign stocks, particularly if the US stock returns are not correlated with foreign stock returns. Risk reduction was shown in Chapter 14 with US stocks, and a US investor can achieve additional diversification by owning foreign stocks. Let us examine the correlation matrix of country stock returns of the G7 (US, Canada (CA), France (FR), Germany (GM), Italy (IT), Japan (JP), and the UK) countries during the 1970-2002 period, shown in Table 1. We use stock indexes of the Morgan Stanley Capital International (MSCI) database. One sees that correlation of US and Canadian MSCI returns are 0.73, which is higher than the correlation between US and Japanese stock returns (0.31). We include the MSCI World Index (WI) in Table 1. A US investor can achieve tremendous diversification by buying Japanese stocks. The reader is reminded of the excess returns of Japanese stocks reported in Chapter 14.

Capital markets have become more integrated during the period of flexible exchange rates, and one sees the more complete integration in Table 2 where the MSCI country index correlations of the G7 countries are shown for the 1995-2002 period. The US-Canada country stock return had a 0.81 correlation, and the US-Japan correlation rises to 0.46. One can (still) achieve diversification with the G7 countries.

If a US investor looked to invest within a particular region of the world, as such Europe (EU), North American (US and Canada), Emerging

Markets (EM), Asia, or Latin America (LA), where could one minimize the US stock returns correlations? The reader is referred to Table 3, the MSCI region return correlation matrix for the 1995-2002 period. It should be obvious that the US and NA correlations are very high (0.99) and offer limited diversification. A US investor could invest in Europe (a correlation coefficient of 0.78), the Emerging Markets (0.69), Latin American (0.65), or Asia (0.57). It would appear that Asia offered the highest diversification for a US investor, given its relatively low correlation coefficient with US returns. The risk reduction of a US investor owning foreign stocks is shown in Figures 1 and 2, courtesy of Professor Solnik.

Table 1. MSCI G7 Stock Market Index Return Correlation Matrix, 1970-2002

Pearson Correlation Coefficients, N = 396

	WI	CD	FR	GM	IT	JP	UK	US	N	MEAN
WI	1.0000	0.7397	0.6612	0.6320	0.4706	0.6724	0.6948	0.8588	396	0.0052
CD	0.7397	1.0000	0.4810	0.4065	0.3384	0.3250	0.5243	0.7307	396	0.0044
FR	0.6612	0.4810	1.0000	0.6604	0.4844	0.3976	0.5667	0.4908	396	0.0056
GM	0.6320	0.4065	0.6604	1.0000	0.4471	0.3703	0.4671	0.4603	396	0.0050
IT	0.4706	0.3384	0.4844	0.4471	1.0000	0.3548	0.3693	0.2881	396	0.0027
JP	0.6724	0.3250	0.3976	0.3703	0.3548	1.0000	0.3777	0.3010	396	0.0070
UK	0.6948	0.5243	0.5667	0.4671	0.3693	0.3777	1.0000	0.5353	396	0.0052
US	0.8588	0.7307	0.4908	0.4603	0.2881	0.3098	0.5353	1.0000	396	0.0053

Table 2. MSCI G7 Stock Market Index Return Correlation Matrix, 1995-2002

Pearson Correlation Coefficients, N = 96

	WI	CD	FR	GM	IT	JP	UK	US	N	MEAN
WI	1.0000	0.8392	0.8250	0.8046	0.6111	0.6368	0.8400	0.9427	96	0.0026
CD	0.8392	1.0000	0.6839	0.6583	0.4674	0.5001	0.6516	0.8062	96	0.0050
FR	0.8250	0.6839	1.0000	0.8469	0.7063	0.4326	0.7649	0.6845	96	0.0043
GM	0.8047	0.6583	0.8470	1.0000	0.6342	0.3097	0.7093	0.7196	96	0.0002
IT	0.6111	0.4674	0.7063	0.6341	1.0000	0.2816	0.5180	0.5103	96	0.0034
JP	0.6368	0.5006	0.4326	0.3097	0.2816	1.0000	0.4676	0.4574	96	-0.0077
UK	0.8400	0.6516	0.7649	0.7093	0.5180	0.4676	1.0000	0.7462	96	0.0027
US	0.9427	0.8062	0.6845	0.7196	0.5103	0.4574	0.7462	1.0000	96	0.0068

Table 3. MSCI Regional Stock Market Index Correlation Matrix, 1995-2002

Pearson Correlation Coefficients, N = 96

	WI	US	EU	NA	EM	Asia	LA	N	MEAN
WI	1.0000	0.9427	0.9009	0.9465	0.7536	0.7357	0.7051	96	0.0026
US	0.9427	1.0000	0.7777	0.9995	0.6861	0.5745	0.6473	96	0.0068
EU	0.9001	0.7777	1.0000	0.7828	0.6567	0.5557	0.6417	96	0.0036
NA	0.9465	0.9995	0.7828	1.0000	0.6967	0.5824	0.6553	96	0.0066
EM	0.7536	0.6861	0.6567	0.6967	1.0000	0.6931	0.8941	96	-0.0054
Asia	0.7357	0.5745	0.5557	0.5824	0.6931	1.0000	0.5555	96	-0.0075
LA	0.7051	0.6473	0.6417	0.6553	0.8941	0.5555	1.0000	96	-0.0032

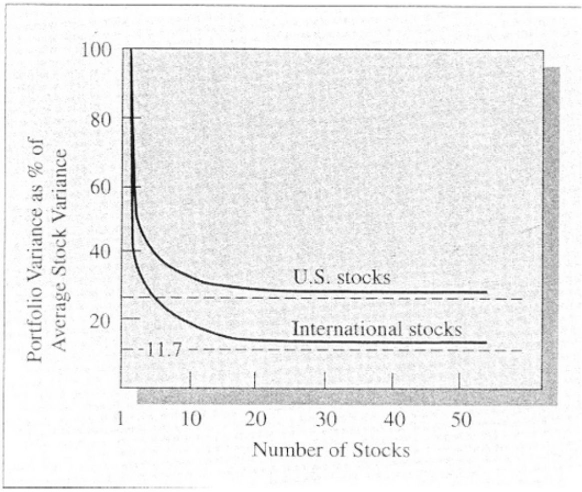

Figure 1. Risk Reduction through Domestic and International Diversification

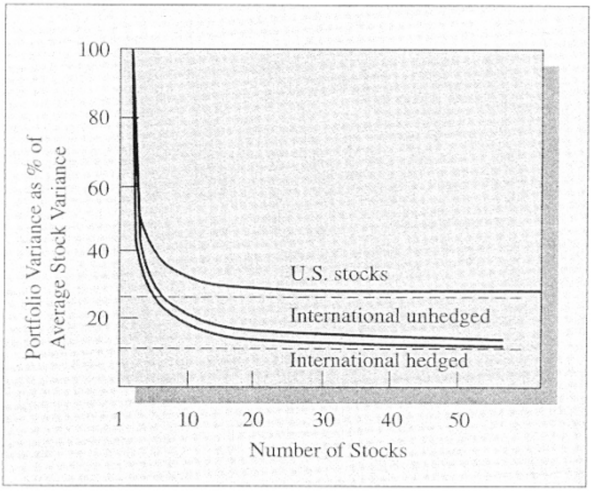

Figure 2. Risk Reduction through Domestic and International Diversification Hedged and Unhedged Results

Note: The vertical axis of the graph is the ratio $^2(\overline{R}_N)/ \quad ^2(\overline{R}_1)$ where N is the number of stocks in the portfolio.

Source: Bruno Solnik, "Why Not Diversify Internationally Rather Than Domestically" *Financial Analysis Journal* 30, no. 4 (July-August 1974), pp. 48-54.

3. INTERNATIONAL STOCK SELECTION

In Chapter 14, we estimated a nine-factor model of US equity holding period returns during the 1990-2002 period. We can estimate the corresponding nine-factor model for Global Securities (the World less US and Canada) and produce a statistically significant model for global portfolio construction during the 1995-2002 period. The components of the model are:

$$TR_{t+1} = a_0 + a_1EP_t + a_2BP_t + a_3CP_t + a_4SP_t + a_5REP_t + a_6RBP_t + a_7RCP_t + a_8RSP_t + a_9CTEF_t + e_t$$

where: EP = [earnings per share]/[price per share] = earnings-price ratio;
BP = [book value per share]/[price per share] = book-price ratio;
CP = [cash flow per share]/[price per share] = cash flow-price ratio;
SP = [net sales per share]/[price per share] = sales-price ratio;
REP = [current EP ratio]/[average EP ratio over the past five years];
RBP = [current BP ratio]/[average BP ratio over the past five years];
RCP = [current CP ratio]/[average CP ratio over the past five years];
RSP = [current SP ratio]/[average SP ratio over the past five years];
CTEF = consensus earnings-per-share I/B/E/S/ forecast, revisions and breadth; and,
e = randomly distributed error term.

Time-Average Value of Estimated Coefficients

a1	a2	a3	a4	a5	a6	a7	a8	a9
.054	.100	.048	.039	.031	.046	.036	.051	.254

The information coefficients for the global securities strategies are:

Table 4. Global Information Coefficients, 1995-2002

Strategy	IC (t)
EP	.024 (16.34)
BP	.009 (5.70)
CTEF	.035 (22.95)
Equal-Weighted	.016 (5.08)
WLRR	.031 (9.94)

The regression-weighted analysis again outperforms the equally-weighted strategy, as we saw in Chapter 14 for the US and Japan. It is interesting to note that analysts' forecasts, revisions, and breadth outperform a composite model during the 1995-2002 period for global securities.

The WLRR model is statistically significant at identifying undervalued securities. Let us use this model to create portfolios composed of stocks in Japan, Hong Kong, Singapore, and Taiwan (the Far East) during the 1995-2002 period. Guerard and Lee (2005) reported simulation results consistent with realized international small capitalization portfolio excess returns.

Table 5. Portfolio Statistics Report

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Feb 1995	-7.82	-8.40	-0.58	1,293
Mar 1995	-4.28	-4.27	0.01	1,280
Apr 1995	-0.46	-0.92	-0.46	1,277
May 1995	-6.45	-6.15	0.30	1,222
Jun 1995	-5.34	-4.63	0.71	1,224
Jul 1995	10.69	10.45	-0.24	1,212
Aug 1995	9.12	8.72	-0.40	1,198
Sep 1995	-0.79	0.18	0.97	1,199
Oct 1995	-0.53	-0.36	0.17	1,191
Nov 1995	4.00	3.38	-0.62	1,183
Dec 1995	6.62	6.17	-0.45	1,103

Summary Section

1995

Total Portfolio Return	2.31
Total Universe Return	2.80
Total Excess Return	-0.49
Average Annual Excess Return	-0.64
Information Ratio of Excess Return	-0.11
Tracking Error	1.77
T-Stat of Info Ratio	-0.35
Annualized Standard Deviation of Portfolio Returns	20.42
Annualized Standard Deviation of Universe Returns	21.04
% of Stocks Outperforming the Universe	46.65
% of Times Portfolio Outperformed the Universe	45.45
Turnover Percentage	85.31

(Continued)

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Jan 1996	4.95	4.81	-0.14	1,105
Feb 1996	-2.25	-1.73	0.52	1,321
Mar 1996	3.80	3.75	-0.05	1,305
Apr 1996	7.55	6.97	-0.58	1,283
May 1996	-0.22	-0.58	-0.36	1,285
Jun 1996	1.36	2.77	1.41	1,287
Jul 1996	-6.48	-6.19	0.29	1,261
Aug 1996	-2.53	-2.83	-0.30	1,321
Sep 1996	2.31	3.30	0.99	1,320
Oct 1996	-3.58	-3.82	-0.24	1,320
Nov 1996	-1.84	-0.79	1.05	1,322
Dec 1996	-6.76	-6.07	0.69	1,322

Summary Section

1996

Total Portfolio Return	-1.43
Total Universe Return	-4.68
Total Excess Return	3.25
Average Annual Excess Return	3.33
Information Ratio of Excess Return	0.44
Tracking Error	2.15
T-Stat of Info Ratio	1.52
Annualized Standard Deviation of Portfolio Returns	14.35
Annualized Standard Deviation of Universe Returns	14.75
% of Stocks Outperforming the Universe	50.04
% of Times Portfolio Outperformed the Universe	50.00
Turnover Percentage	177.72

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Jan 1997	-5.07	-3.94	1.13	1,322
Feb 1997	-1.30	-0.19	1.11	2,411
Mar 1997	-4.26	-3.71	0.55	2,399
Apr 1997	0.81	2.51	1.70	2,379
May 1997	5.72	5.78	0.06	2,401
Jun 1997	1.70	1.73	0.03	2,390
Jul 1997	-5.76	-4.28	1.48	2,206
Aug 1997	-8.15	-8.77	-0.62	2,398
Sep 1997	-12.21	-10.76	1.45	2,395
Oct 1997	-1.46	-1.78	-0.32	2,389
Nov 1997	-10.89	-10.20	0.69	2,393
Dec 1997	-11.82	-11.52	0.30	2,376

Summary Section

1997

Total Portfolio Return	-38.06
Total Universe Return	-42.80
Total Excess Return	4.73
Average Annual Excess Return	7.83
Information Ratio of Excess Return	0.87
Tracking Error	2.51
T-Stat of Info Ratio	3.01
Annualized Standard Deviation of Portfolio Returns	18.79
Annualized Standard Deviation of Universe Returns	18.96
% of Stocks Outperforming the Universe	51.25
% of Times Portfolio Outperformed the Universe	83.33
Turnover Percentage	172.05

(Continued)

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Jan 1998	20.65	20.33	-0.32	2,336
Feb 1998	4.71	464	-0.07	2,588
Mar 1998	-2.99	-2.45	0.54	2,580
Apr 1998	-5.05	-4.44	0.61	2,585
May 1998	-0.50	0.20	0.70	2,568
Jun 1998	-0.36	0.42	0.78	2,552
Jul 1998	2.62	4.62	2.00	2,326
Aug 1998	-11.05	-11.38	-0.33	2,571
Sep 1998	-6.84	-6.44	0.40	2,563
Oct 1998	-2.07	-2.18	-0.11	2,565
Nov 1998	12.15	13.57	1.42	2,562
Dec 1998	-4.14	-3.56	0.58	2,562

Summary Section

1998

Total Portfolio Return	9.76
Total Universe Return	3.28
Total Excess Return	6.48
Average Annual Excess Return	6.39
Information Ratio of Excess Return	0.78
Tracking Error	2.31
T-Stat of Info Ratio	2.69
Annualized Standard Deviation of Portfolio Returns	28.98
Annualized Standard Deviation of Universe Returns	28.71
% of Stocks Outperforming the Universe	49.89
% of Times Portfolio Outperformed the Universe	66.67
Turnover Percentage	290.92

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Jan 1999	1.28	1.74	0.46	2,548
Feb 1999	3.18	5.23	2.05	2,868
Mar 1999	11.87	13.51	1.64	2,859
Apr 1999	11.92	13.57	0.65	2,820
May 1999	-2.91	-2.38	0.53	2,855
Jun 1999	13.22	14.79	1.57	2,738
Jul 1999	1.59	2.20	0.61	2,672
Aug 1999	-0.61	-0.65	-0.04	2,832
Sep 1999	-1.29	-2.02	-0.73	2,815
Oct 1999	-3.70	-5.01	-1.31	2,815
Nov 1999	-5.31	-6.77	-1.46	2,803
Dec 1999	-4.56	-5.57	-1.01	2,805

Summary Section

1999

Total Portfolio Return	28.67
Total Universe Return	24.77
Total Excess Return	3.90
Average Annual Excess Return	4.03
Information Ratio of Excess Return	0.28
Tracking Error	4.13
T-Stat of Info Ratio	0.96
Annualized Standard Deviation of Portfolio Returns	25.78
Annualized Standard Deviation of Universe Returns	22.24
% of Stocks Outperforming the Universe	42.92
% of Times Portfolio Outperformed the Universe	58.33
Turnover Percentage	266.92

(Continued)

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Jan 2000	4.35	5.11	0.76	2,798
Feb 2000	-1.85	-3.72	-1.87	2,970
Mar 2000	3.29	5.22	1.93	2,906
Apr 2000	-5017	-4.70	0.47	2,953
May 2000	0.52	2.59	2.07	2,944
Jun 2000	8.36	10.95	2.59	2,909
Jul 2000	-4.70	-2.67	2.03	2,797
Aug 2000	1.05	0.09	-0.96	2,829
Sep 2000	-4.25	-3.82	0.43	2,702
Oct 2000	-8.30	-7.67	0.63	2,768
Nov 2000	0.06	-0.02	-0.08	2,805
Dec 2000	-2.97	-1.76	1.21	2,832

Summary Section

2000

Total Portfolio Return	-1.85
Total Universe Return	-10.31
Total Excess Return	8.46
Average Annual Excess Return	9.61
Information Ratio of Excess Return	0.61
Tracking Error	4.36
T-Stat of Info Ratio	2.11
Annualized Standard Deviation of Portfolio Returns	17.31
Annualized Standard Deviation of Universe Returns	15.53
% of Stocks Outperforming the Universe	49.63
% of Times Portfolio Outperformed the Universe	75.00
Turnover Percentage	68.83

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Jan 2001	3.01	3.18	0.17	2,862
Feb 2001	2.91	5.36	2.45	3,166
Mar 2001	2.96	4.49	1.53	1,629
Apr 2001	6.97	9.02	2.05	1,630
May 2001	0.37	1.68	1.31	1,632
Jun 2001	-0.02	2.54	2.56	1,624
Jul 2001	-8.10	-7.85	0.25	1,561
Aug 2001	-4.40	-3.01	1.39	1,565
Sep 2001	-9.66	-9.51	0.15	1,566
Oct 2001	6.26	5.76	-0.50	1,575
Nov 2001	-0.70	-1.76	-1.06	1,387
Dec 2001	-1.63	-3.15	-1.52	1,369

Summary Section

2001

Total Portfolio Return	5.08
Total Universe Return	-3.49
Total Excess Return	8.57
Average Annual Excess Return	9.14
Information Ratio of Excess Return	0.57
Tracking Error	4.49
T-Stat of Info Ratio	1.96
Annualized Standard Deviation of Portfolio Returns	18.79
Annualized Standard Deviation of Universe Returns	17.18
% of Stocks Outperforming the Universe	47.76
% of Times Portfolio Outperformed the Universe	75.00
Turnover Percentage	69.11

(Continued)

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Date	Universe Return	Portfolio Return	Excess Return Portfolio-University	Universe Stocks with Valid Returns
Jan 2002	-0.89	0.07	0.96	1,397
Feb 2002	3.98	7.14	3.16	1,544
Mar 2002	6.17	7.58	1.41	1,533
Apr 2002	2.99	3.77	0.78	1,530
May 2002	4.58	4.53	-0.05	1,512
Jun 2002	-6.53	-5.82	0.71	1,494
Jul 2002	-3.22	-2.50	0.72	1,466
Aug 2002	-3.52	-3.08	0.44	1,458
Sep 2002	-4.11	-3.07	1.04	1,454
Oct 2002	-5.84	-5.95	-0.11	1,442
Nov 2002	1.28	0.86	-0.42	1,399
Dec 2002	-3.41	-3.68	-0.27	1,357

Summary Section

2002

Total Portfolio Return	-1.39
Total Universe Return	-9.16
Total Excess Return	7.78
Average Annual Excess Return	8.70
Information Ratio of Excess Return	0.76
Tracking Error	3.20
T-Stat of Info Ratio	2.62
Annualized Standard Deviation of Portfolio Returns	15.87
Annualized Standard Deviation of Universe Returns	14.43
% of Stocks Outperforming the Universe	48.38
% of Times Portfolio Outperformed the Universe	66.67
Turnover Percentage	42.56

Table 5. Portfolio Statistics Report (Continued)

Far East – WLGL

Up Periods	
Portfolio Return – Annualized	97.95
Universe Return – Annualized	80.92
Diff. Annual Portfolio and Annual Universe Returns	17.03
Average Annual Excess Return	9.94
Information Ratio of Excess Return	0.74
Tracking Error	3.71
T Stat of Info Ratio	4.62
Annualized Std-Dev of Portfolio Returns	15.34
Annualized Std-Dev of Universe Returns	15.06
% of stocks in Pfo, outperforming the Universe	46.90
% of times the Pfo outperformed the Universe	64.10
Annualized Turnover Percentage	76.11
Total Periods Up	39
% of Periods Up	41.05
Down Periods	
Portfolio Return – Annualized	-39.28
Universe Return – Annualized	-41.38
Diff. Annual Portfolio and Annual Universe Returns	2.11
Average Annual Excess Return	3.45
Information Ratio of Excess Return	0.33
Tracking Error	2.97
T Stat of Info Ratio	2.46
Annualized Std-Dev of Portfolio Returns	10.97
Annualized Std-Dev of Universe Returns	10.77
% of stocks in Pfo, outperforming the Universe	49.23
% of times the Pfo outperformed the Universe	66.07
Annualized Turnover Percentage	57.82
Total Periods Down	56
% of Periods Down	58.95
All Periods	
Portfolio Return – Annualized	-1.36
Universe Return – Annualized	-6.90
Diff. Annual Portfolio and Annual Universe Returns	5.53
Average Annual Excess Return	6.07
Information Ratio of Excess Return	0.50
Tracking Error	3.41
T Stat of Info Ratio	4.87
Annualized Std-Dev of Portfolio Returns	21.35
Annualized Std-Dev of Universe Returns	20.52
% of stocks in Pfo, outperforming the Universe	48.25
% of times the Pfo outperformed the Universe	65.26
Annualized Turnover Percentage	39.16
Total Periods Down	56
Total Periods Up	39
% of Periods Down	58.95
% of Periods Up	41.05

4. EFFICIENT PORTFOLIO OPTIMIZATION RESULTS IN THE PACIFIC REGION MARKETS

Our portfolio analysis uses the regression-based WLRR composite security valuation model, shown in equation (1). We purchase the highest ranked 30 percent of securities by the composite strategy, and sell when the securities fall into the bottom half of the distribution, holding the securities in equally-weighted portfolios. The portfolios are rebalanced monthly. The portfolios produce average annual returns of -1.06 percent, whereas the average universe return is -6.90, percent, generating a 5.53 percent average annual excess return. The portfolios have annualized turnover of 39.19 percent, with an average annual tracking error of 3.41 percent. The t-value of the information ratio is 4.87, and is statistically significant at the 5 percent level. One could have held a 200 stock portfolio, rather that the highest ranked 30 percent securities, and the 200 stock portfolio produced excess returns of 535 basis points, with tracking error of 5.75 percent, and a t-statistic on the information ratio of 2.95, which is still statistically significant.[2]

The global stock security model was statistically significant at identifying undervalued stocks in the Pacific Rim during the 1995-2002 period. The reader is reminded that Bloch *et al.* (1993) found few differences in U.S. and Japanese stock selection models. It also has been demonstrated that the model excess returns have been realized in the Bloch *et al.* (1993) and GlobeFlex Capital portfolios. The question may be asked as to whether the Japanese and other Asian markets are relatively inefficient, or whether the fundamental data, i.e., the price-to-earnings (PE) multiples, the price-to-cash flow (PCF), the price-to-sales (PS) ratios are so low as to favor the Pacific Rim investors. First, in the 1980s and early 1990s, the time of the Bloch *et al.* (1993) analysis, the Japanese PE often approached 100, very high for world comparisons. Fundamental models worked well despite the "seemingly high" ratios. As of November 2004, the Japanese PE of the stocks of the FTSE (Financial Times Stock Exchange Index) was 23.4, whereas the FTSE All-World Index average was 20.2. The Japanese FTSE stocks had a price-to-book ratio of 1.7, far less than the FTSE All-World Index average of 2.6. The Japanese FTSE stocks had a price-to-sales ratio of 0.7, whereas the FTSE All-World Index average was 1.2. The Japanese market has mixed relative fundamental data, as do the Pacific Rim nations, but a fundamental model produces portfolios with statistical significant stock selection. If one wants to invest in low PE countries, then one would have invested in Columbia, India, Pakistan, Thailand, Italy, and Turkey in November 2004. See Table 7.

Table 7. FTSE All-World Index

PE	PB	PS	ROE	Country	Returns 12M	Market Cap	Index Wgt. %	No. of Stocks
Americas								
23.4	2.4	1.4	10.2	Argentina	32.41	5,113	0.02	6
11.0	2.3	1.3	22.3	Brazil	51.58	125,539	0.55	55
21.2	2.5	1.5	11.9	Canada	28.39	577,426	2.54	71
22.2	1.9	2.0	8.9	Chile	27.16	26,575	0.12	23
7.6	1.5	1.2	22.3	Colombia	125.04	3,853	0.02	6
15.6	2.9	1.5	20.1	Mexico	49.05	97,864	0.43	28
26.6	3.0	4.0	11.5	Peru	-5.46	3,483	0.02	3
21.9	3.2	1.7	15.8	USA	12.78	11,362,201	50.03	633
Asia Pacific								
21.1	2.6	1.6	12.2	Australia	38.15	494,563	2.18	114
17.8	2.0	1.5	13.3	China	23.83	62,423	0.27	109
21.7	1.8	3.2	8.7	Hong Kong, China	24.08	264,703	1.17	107
15.3	3.2	1.7	22.2	India	26.60	80,672	0.36	70
13.3	3.5	1.9	29.0	Indonesia	64.66	18,816	0.08	14
23.4	1.7	0.7	8.2	Japan	17.70	1,972,962	8.69	481
14.8	1.5	0.6	12.9	Korea	27.89	237,848	1.05	95
17.2	2.1	2.0	12.8	Malaysia	19.19	59,373	0.26	61
23.9	2.4	1.8	10.4	New Zealand	38.57	22,701	0.10	23
9.5	2.4	0.7	26.5	Pakistan	14.40	2,462	0.01	9
23.0	1.8	1.6	7.7	Philippines	47.11	4,564	0.02	11
16.1	1.7	2.3	10.8	Singapore	23.89	80,041	0.35	51
18.2	1.9	1.6	11.0	Taiwan	8.90	252,478	1.11	159
13.4	2.7	1.7	25.8	Thailand	16.44	26,818	0.12	44
Europe								
21.8	2.3	1.4	11.5	Austria	65.75	30,006	0.13	8
15.1	2.1	0.9	14.2	Belgium & Luxembourg	51.55	115,507	0.51	19
24.9	1.5	1.9	5.9	Czech Republic	112.95	7,318	0.03	4
15.7	2.2	1.5	14.6	Denmark	34.78	78,202	0.34	14
16.5	2.5	1.3	15.0	Finland	3.10	119,894	0.53	10
22.0	2.2	0.8	10.7	France	25.51	928,161	4.09	61
23.3	1.7	0.6	7.3	German7	22.03	684,282	3.01	52
19.3	2.6	1.9	14.4	Greece	55.58	47,873	0.21	12
14.1	2.8	1.6	21.8	Hungary	100.10	16,961	0.07	6
20.7	2.8	1.8	13.9	Ireland	32.68	72,900	0.32	8
18.9	2.2	1.0	12.2	Italy	29.24	433,335	1.91	48
13.0	2.4	0.7	19.4	Netherlands	19.14	446,510	1.97	22
13.8	1.9	0.9	14.6	Norway	60.42	55,209	0.24	8
21.3	2.4	1.3	9.8	Poland	63.48	18,185	0.08	12
21.0	2.4	1.6	11.7	Portugal	28.51	38,079	0.17	8

(Continued)

Table 7. (Continued)

PE	PB	PS	ROE	Country	Returns 12M	Market Cap	Index Wgt. %	No. of Stocks
9.1	1.3	1.3	15.8	Russia	17.40	47,554	0.21	11
16.6	2.8	1.6	17.7	Spain	36.33	399,321	1.76	31
24.2	2.3	1.2	9.4	Sweden	46.63	247,047	1.09	32
17.1	2.8	1.4	16.5	Switzerland	18.77	623,095	2.74	33
11.0	1.8	0.8	19.8	Turkey	60.86	17,593	0.08	24
17.3	2.2	1.3	12.8	UK	24.78	2,286,737	10.07	147
Middle East and Africa								
16.3	4.7	3.3	29.8	Egypt	112.58	4,430	0.02	8
23.0	2.4	1.4	11.3	Israel	5.62	33,335	0.15	44
12.6	1.6	0.8	14.2	Morocco	22.82	978	0.00	5
15.1	2.5	1.1	17.1	South Africa	50.66	176,602	0.78	78
20.2	**2.6**	**1.2**	**13.4**	**FTSE All-World Index**	**18.75**	**22,711,591**	**100.00**	**2,878**

Source: FTSE All-World Index, Nomura Monthly Issues.

5. INTERNATIONAL CORPORATE FINANCE DECISIONS

If access to global capital markets allows multinational enterprises (MNE) to lower its equity costs and costs of capital relative to domestic firms, the MNE could maintain a higher desired debt ratio relative to domestic firms, even with large new capital issues. Eiteman, Stonehill, and Moffett (2004) believe that the marginal cost of capital may be constant for a great range of the MNE capital budgets.[3] Moreover, despite the favorable effect of international diversification of MNE cash flow, bankruptcy risk of MNE is approximately equal to that of domestic firms. If a US firm issues foreign currency-denominated debt, such as a US firm issuing 8 percent debt in Germany, and the Euro appreciates in the coming year, then the US firm's dollar cost of obligations for repaying principal and interest must rise due to the appreciation of the Euro.[4] Many firms attempt to manage currency exposures through hedging. Hedging is taking a position to that will change to offset the change in value of an existing position. Currency risk can be defined as the variance in expected cash flow due to unexpected changes in exchange rates. Hedging can reduce the risk of future cash flow, and reduce the likelihood that cash flow will fall below a necessary minimum balance. If a firm has an obligation payable in another currency, then it may want to hedge the obligation. Imagine that a US firm purchases an input, such as cocoa from a German firm, that is payable in 90 days. The firm could hedge the obligation, purchasing, for example, 100 million Euro of cocoa, could purchase 100 million Euros in the forward market for delivery in 90 days. If the Euro increases in value, the potential loss on the transactions (payable) is offset by the gain of the forward exchange purchase.

Exchange rate variability can affect the firm's financial decisions. In a perfectly integrated international capital market, the equilibrium forward rate is determined such that hedging will not produce a profit. Aliber (1978) found that the average deviation of the forward rate from the future spot rate approached zero as the time horizon expands. There is no need to hedge if long-term nominal foreign currency assets are not exposed in the long-run. Commodity price parity (CPP) holds that physical assets are not exposed to exchange rate risk as long as the purchasing power parity theory (PPPT) holds. However, Adler and Dumas (1983), state that the prices of input goods and output may have different exposures such that PPPT and CPP may not be sufficient for sound financial management.

In an efficient market, there may be minimal advantages to hedging. A financial manager for Hershey would be extremely naïve (or lucky) if he or she did not hedge their chocolate purchases. However, if an investor wanted to have a Japanese-only portfolio, and the yen has been a strong currency during the 1973-2002 period, why would an investor hedge the currency risk?

Notes

[1] A key cross currency rates table as of September 6, 2006 would be:

Currency	USD	EUR	JPY	GBP	CAD
USD	….	1.2785	.008574	1.8820	.9026
EUR	.7821	….	.00671	1.4720	.7060
JPY	116.63	149.11	….	219.50	105.27
CAD	1.1079	1.4165	.00950	2.0851	…..
AUD	1.3046	1.6680	.01186	2.4553	1.1776

The US dollar continues its depreciation versus the Euro and Yen in 2006.

[2] The GlobeFlex Capital proprietary modeling and trading systems have outperformed the respective benchmarks for many capitalizations during their real-time trading periods. The past one-year and three-year returns, ended September 30, 2004, are given in Table 6. The GlobeFlex portfolio index returns lead to higher Sharpe ratios, because the portfolios normally produce significantly smaller standard deviations than the Index returns. The three-year GlobeFlex portfolio performances rank at the 33rd, 13th, and 10th percentile of the

Callan Associates universe for the Small Cap Growth, Mid Cap, and INTL Small Cap managers, respectively , returns indicate the relative efficiency of the US market, and the potential abroad. All portfolios have out-performed since inception. John Guerard served on the virtual research team at GlobeFlex Capital Management during the period when this monograph was developed. Guerard and Mark and GlobeFlex demonstrated that quantitative models could be used to out-perfrom the market, as was the case of Bloch *et al.* in Chapter 14.

Table 6. Portfolio Performance

Portfolio	Portfolio Return	Index Return	Period
Small Cap Growth	-.5%	-0.7%	Year-to-Date
	9.0	9.1	Three-Year
	33rd		Percentile Performance
Mid Cap	13.4	8.3	Year-to-Date
	8.3	5.8	Three-Year
	13th		Percentile Performance
INTL Small Cap	27.9	19.5	Year-to-Date
	19.7	10.5	Three-Year
	10th		Percentile Performance

Source: Guerard and Mark (2003).

[3] E. Schwartz put forth a similar position for US firms in Chapter 10.

[4] In the 1990s, German and Japanese firms used greater leverage than US and UK firms, primarily due to lower debt costs. These relative advantages disappeared in the late 1990s ad early 2000s, leading the German and Japanese firms to reduce their leverage. The leverage ratio was relatively constant for Us and UK firms [Eun and Resnick (2004) and McCauley and Zimmer (1994)].

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Chapter 22

MANAGEMENT-STOCKHOLDER RELATIONS

So long as a company is closely held, the control group and the stockholders are identical and seldom is there a conflict of interest between them.[1] However, once a company goes public it acquires a group of shareholders who depend on the management for the safety and profitability of their investment. In short, an agency principal relation is established where the management is the agent and the shareholder is the principal. This relation implies a commitment by management that the outside shareholders will be treated fairly in such matters as cash payouts, expansion policies, accounting probity, and the level of executive compensation, and that in general the company affairs will be directed vigorously and conscientiously.

Discussions on the problem of the separation of corporate control and ownership date back to the 1930s.[2] Nevertheless, it may be well to note that the shareholder's abdication of a direct concern in managing the firm may be a natural consequence of the organizational development of the large corporation. The average shareholder desires and expects a reasonably competent and just management. Beyond that he is not much concerned for in most cases his major economic activities lie elsewhere.

The history of corporations is full of instances where an inside group abused its position of power to enrich itself at the expense of the shareholders. Boards of directors, promoters, and management have at times taken a position of *caveat emptor* ("let the buyer beware") toward the investors in corporations. The exact legal obligation of the board of directors to the shareholders has never been clearly defined. The NYSE requires that the majority of all directors be "independent," as must be all directors on the audit nominating, executive-compensation, and corporate-governance committees.[3] Insiders, such as top executives of the firm, cannot be considered independent. Nevertheless, by a process of financial education, of legal and governmental administrative decisions, and by a voluntary assumption by managements themselves, management has come to be viewed as having a quasi-fiduciary responsibility to the shareholders. A successful management is somewhat of a trustee of the stockholders' interests.

The inherent structure of the corporation no doubt permits management possible laxity or indifference to the welfare of the shareholders. But the fact is that shareholders as a group have received substantial economic rewards over time. It is only logical to assume that the managements in the majority of corporations possess considerable sense of duty and loyalty.[4]

If a firm succeeds in generating exceptional earnings, then how should the profits be divided among the inside managers and the shareholders? The argument is made that the average stockholder does not contribute much to the success of his company; if he buys in after the firm is well established (as most stockholders do), he has not shouldered much of the initial risk. Thus, the argument runs, the stockholders should be satisfied with a "normal return"; anything in excess of a "normal return" is ascribed to the superior talents or energy of the initial innovating or managerial group and is properly their reward. A normal return can be derived from its beta and the required rate of return from the CAPM. There is some merit to this view insofar as economic incentives should be provided for innovation and good management under the theory of agency. The argument fails to recognize, however, the overall function of risk capital in the economy. The tremendous gains which have on occasion accrued to the shareholders of a spectacularly successful company are in large part offset by the losses taken on many enterprises that fail. If the chance of obtaining potentially large rewards were not available, the supply of venture capital would dry up. The return for risk may seem to come after the risk is over, but to reduce this return ex post is to reduce the supply of new risk-bearers on the next round.

1. GENERAL AGREEMENT AND POTENTIAL CONFLICTS IN MANAGEMENT AND CONTROL

Before going on to some of the possible conflicts between shareholders and management, one might point out that the interests of these two groups are largely parallel rather than divergent. If the company is profitable, the management obtains increases in income and prestige. Company executives are rewarded with higher salaries, bonuses, stock option plans, and increased respect from their peer groups. Furthermore, although the control group's major income may derive from their salaries and other managerial perquisites and their stockholdings represent only a small fraction of the shares outstanding, these holdings may still be valuable enough to constitute a strong economic incentive to do well for the company. One cannot discount the subtle but powerful psychological motivations toward purposeful activity. If the executive groups have any morale at all, they identify with the company. If their actions have any meaningful social goal, they are directed toward achieving prosperity for the corporation. A management that is indifferent, or at worst is engaged in systematically looting the firm, has reached a state of group disorganization or disintegration. That the majority of managements are fundamentally honest in protecting the interests of the stockholders is an implicit assumption of a workable free enterprise system.[5]

2. AREAS OF POTENTIAL CONFLICT

Although there is an identity of major interests between shareholders and management, it is unrealistic not to recognize that these interests are likely to diverge at some important points. Usually, the conflicts are only potential, and the corporate policy (especially if the firm has good earnings) can easily accommodate the differing economic positions of the two groups.

2.1 Managerial and Board of Directors Compensation

A strongly entrenched management is able, within wide limits, to set its own compensation. Obviously the higher the officer and executive salaries the smaller the earnings available for the common shareholders. On the other hand, a level of managerial compensation that moves up with improved company earnings provides incentives for top-notch performance. If a firm wishes to attract exceptional administrative talent, it has to offer a competitive economic reward. One need only read the popular business press to see the wide range of opinions concerning Dick Grasso's compensation as Chairman of the New York Stock Exchange and its implications for management and the board. Nevertheless, at some point the boundary is crossed between sufficient and too much. Stockholders could contribute to the health of their company by asking intelligent questions about executive compensation at the annual shareholders meetings. Should the company refuse to moderate grossly unreasonable levels of officers' compensation, the stockholders' suit is a strong weapon.

About seventy years ago, Berle and Means wrote a best seller on the clash of interests involved in the separation of ownership and control in the modern corporation.[6] More recent economic and management *gurus* have attacked the problem under a new name. It is called agency theory. [Jensen and Meckling (1976)] The gist of agency theory deals with the construction of a compensation or reward system so that the interests of the agent (the management) largely coincide with those of the principal (the shareholders).

The massive abuse of agency/principal relations is at the heart of the current Enron, World Com, and Adelphia debacles.[7] The perceived evidence is that the inside owners and managers raided the till for the enhancement of their personal enjoyment and wealth at the expense of the outside shareholders. Beneath the froth and turmoil, the basic question remains: how is corporate governance to be structured and how is management to be paid so that its interests coincide with the long-run prosperity of the shareholders?

3. EXECUTIVE COMPENSATION

Economists since the time of Roberts (1959) and Lewellen (1968) have empirically studied the problem of executive (CEO) compensation. Several issues are involved. Compensation should include a cash salary, a cash bonus, stock option exercises, or better yet restricted grants of stock which must be held for a specified time before they can be sold. The determinants of executive compensation may often be placed within two categories: those reflecting the size of the firm, and those reflecting the performance of the firm. Roberts used size variables such as sales, assets, and profits as independent variables in the compensation equation estimation. There is, of course, severe multicollinearity among sales, assets, and profits, for many firms. One will use only the sales variable in this chapter. One can use five-year least squares (5LS) growth rates in sales (Sales5LS), earnings per share (EPS5LS), and total returns to stockholders (TR5LS), as well as ROE, as performance measures. One can use the Compustat EXECCOMP database from the WRDS system, which derives its data from proxy statements and 7OK filings with the SEC. The Compustat executive compensation means are shown in Table 1, and indicate that cash bonuses and total direct compensation levels have risen during the 1992-2002 period, particularly relative to cash salary.

One can pool the data during the 1992-2002 period, and ran regressions for three compensation variables the reader is referred to Table 2 for pooled regression results. CEO salary is positively, and significantly, associated with sales level and the return on equity, ROE. CEO salary is not a function of sales and eps growth, or the five-year return to

Table 1. Mean Executive Compensation ($ Thousands)

Year	N	Salary	Cash Bonus	Total Direct Compensation
1992	433	$622.7	$514.5	$2810.6
1993	1157	542.2	427.9	2159.4
1994	1548	514.2	436.7	1646.4
1995	1600	530.7	490.4	2009.9
1996	1651	548.4	594.7	2587.2
1997	1674	563.9	620.8	3570.4
1998	1731	579.9	604.8	4620.1
1999	1811	582.8	692.8	4187.5
2000	1791	607.1	734.4	6130.7
2001	1637	646.3	664.8	4549.7
2002	538	805.9	1083.7	5801.7

stockholders. CEO bonus is positively and significantly, associated with sales, ROE, and five-year return to stockholders. Total direct CEO compensation, including stock options exercised, is a function of sales, ROE, five-year sales growth, and the five-year return to stockholders.

The empirical evidence supporting size and performance measures is reassuring, particularly given the growth in bonuses and total direct compensation. A well-known executive compensation study was produced by Lewellen (1968), who analyzed salary and bonus and total compensation of 50 large industrial companies during the 1945-1963 period. Lewellen found that compensation, defined as salary plus bonus, was statistically associated with sales, net income, and the market value of the firm. There was no statistically significant correlation between the performance and size measures and total compensation. Using the EXECCOMP database during the 1992-2002 period, one finds statistically

Table 2. Pooled Regression Determinants of Executive Compensation, 1992-2002

Compensation Variable	Constant	Sales	ROE	Sales5LS	EPS5LS	TR5LS	F	$\overline{R}^2$
Salary	.054	.449	.155	-.169	0.021	0.019	554	.249
(t)	(4.84)	(51.23)	(3.35)	(-6.76)	(-1.39)	(-1.24)		
Bonus	.010	.305	.144	.011	.008	.202	216	.114
	(0.74)	(28.85)	(2.56)	(0.35)	(0.46)	(11.09)		
Total Direct	-.022	.237	.177	.061	0.008	.229	163	.089
Compensation	(-1.64)	(22.09)	(3.13)	(2.01)	(0.44)	(12.42)		

significant correlations between salary and bonus and sales, net income, and market value of the firm. Moreover, one finds highly statistically significant correlations between total compensation and size and performance measures. One finds very similar correlation coefficients in the Lewellen (1968) study and the analysis of the EXECCOMP database. Executive compensation is correlated with size and performance measures of a large sample of firms during the 1992-2002 period.

Table 3. Executive Compensation Correlations Lewellen (1968)

	Salary + Bonus (t)	Total Compensation (t)
Sales	.285 (1.71)	.213 (1.43)
NI	.253 (1.77)	.155 (1.03)
MKTVAL	.275 (1.88)	.203 (1.43)
Executive Compensation Database		
Sales	.349 (46.4)	.192 (24.4)
NI	.225 (28.7)	.112 (14.0)
MKTVAL	.324 (42.6)	.302 (39.4)

where NI = Net Income,
MKTVAL = Market Value of Firm.

A residual plot reveals no evidence of heteroskedasticity, and the condition number of 2.28 reveals no evidence of multicollinearity in the total direct compensation pooled regression.

Recent CEO compensation research by Dow and Raposo (2006) recommends that shareholders should commit to a policy of high pay, with high-powered initial incentive packages, to provide an atmosphere for CEOs to improve strategy making and curb CEO tendencies for regarding restructuring and other dramatic events. Dow and Raposo further suggest that shareholders never precommit to pay very high compensation packages required to implement dramatic change.

4. BOARD OF DIRECTORS

Supposedly the Board of Directors are elected by the shareholders; in fact, they are usually nominated by the management and the subsequent election is perfunctory. In general, the members of the board are honorable citizens, competent in their various professions. The managers of TIAA (the largest pension fund in the country) assert that the majority of the board should be outside directors, as distinct from inside directors who hold managerial positions. Most importantly the outside directors should comprise the majority of the audit and the managerial compensation committees. Given the proper incentives, the directors could perform their job as the un-biased questioners and broad supervisors of managerial policies.

Shareholders should look at the director's cash pay. The members of the board at Enron were getting $350,000 a year, although most directors of publicly traded firms make $35,000-$40,000, annually. Beware when the cash compensation of the directors seems too high! Their job has become too precious, and they are unlikely to question or scrutinize any managerial report.

Of course, the board should be rewarded. They have an important balancing function within the governing framework of the corporation. However, their current annual cash pay and the accompanying perks should be moderate. Their major compensation should be an award of substantial amounts of common stock, restricted, not saleable for five years or after retirement whichever comes later.

Compensation in the form of restricted shares would focus the directors on the interests of the long run stockholders. The board should be concerned about helping shape policies for a viable firm which generates a satisfying return for its shareholders over time.

The compensation scheme for the top executives might differ somewhat from that proposed for the board of directors. Because, in contrast to the directors, the manager's main current income comes from their employment with the company, their cash pay should be higher. It should be set at a level enabling them to maintain a life style proper to their status, perhaps at about the amount of the average pay for a major league ball player. Bonuses and other major additional rewards should be in the form of restricted or deferred saleable shares.

5. STOCK OPTIONS

The short term stock option, a most harmful and deleterious form of award, should be abolished. The stock option entitles the holder to buy shares in the near future at a fixed price which is set below the forecasted market. Presumably, the option ties the managers to the shareholder's interest of maximizing the value of the company's stock. But the stock option fixes the manager's attention on the short term horizon. Unfortunately, the most lucrative way to cash in on an option is to manipulate the books, defer expenses and anticipate revenues, so that the market is fooled and the price of the shares rises sharply just at the time you prepare to sell your option acquired stock.

A stock option plan giving the officers an opportunity to purchase company shares at a previously fixed price is a type of compensation whose presumed value is contingent on good economic performance by the company. Unless the management's activities cause an appreciation of the corporation's shares in the market, the executives do not realize any significant gain from their options. However, as noted previously, in many instances, short term options have proven a disaster. They have encouraged short sighted managers to indulge in manipulative activities that boomed the speculative market value of the shares at the expense of the longer run interests of the company.

Moreover, the shareholders may fail to realize how much economic value they may be allowing to the management in the form of stock options. Because no asset leaves the company nor is any explicit liability created, the corporation's accounts do not register the impact of the option. Yet these options represent a potential dilution of the equity of the shareholders, and if the number of shares under option is a large enough fraction of the total shares outstanding, exercising the option could reduce the earnings per share. The existence of the options can act as a drag on the potential appreciation of the common stock.

Worse yet is the case where large options and saleable shares are granted to a top manager just before his retirement. Here the manager was happy if financial activities could be manipulated so that the stock reached the high point at the time of his leaving. It didn't matter if this price was not likely to be supported by the market over any length of time. As the French expression goes, *aprés moi l'deluge*. The disaster comes after I'm gone.

6. BONUSES

In addition to their regular salary, many corporation officers receive bonuses based on the company's earnings. Generally, the bonus increases if the firm's profits exceed a base level. A bonus plan has many merits since it lowers managerial costs in poor years, when the company can least afford them, and increases them in years when the company's economic position is better. By making part of the officers' incomes contingent on profitable operations, it furnishes a strong incentive for conscientious management. It is important to re-examine the bonus formula periodically to ascertain whether the base level of earnings has been left at an inappropriately low level without proper consideration to the subsequent growth of the company.

Pension plans are another means of executive remuneration that have come into favor. The promise of a pension may be more valuable to the recipient than an immediate increase in salary of the same amount, since pension payments are likely to be made when his income tax bracket is considerably lower.[8] A generous pension plan gives the firm an advantage in attracting and holding good managerial talent. But pensions may seem unduly high when, as sometimes happens, they are only slightly lower than the active officer's salary and generous pensions that were not voted in advance but are settled upon shortly before the executives' retirement may be somewhat suspect.

A number of sharp changes have taken place in the structure of the economy. Contrary to the Professor Joseph Schumpeter prognosis, management of modern industry may not have devolved into a set of staid, standard procedures. The old standard industries are gone, and the new industries staffed by technicians may be considerably more difficult to manage. (As the expression goes, managing technicians may be compared to herding cats.) We are in an era of innovation and rapid change. Catching the right wave leads to success and a big return, and missing the opportunity results in failure. If the risk/return ratio has widened, perhaps we might also expect a rise in the compensation paid for decision making.

6.1 Dividends, Buy Backs, and Retained Earnings

The theoretical value of a common stock is the discounted value of its future cash dividends and net buybacks over purchase price plus a possible final sale or liquidation value. Since the present value of a future dividend or buy back cannot equal that of the immediate payments, the current level of buybacks and dividends is important in setting the intrinsic value of the stock (see Chapter 8). Stockholders are, therefore, extremely interested in the management's dividend or buy back policies. Retained earnings have value to the stockholder only as they can be invested profitably at a rate of return within the company that at a minimum equals the market equity discount rate and thereby generates increased earnings and future dividends.[9]

Management may evaluate the importance of dividends or buy backs versus retained earnings differently than the shareholders. Usually management obtains more of its current income from salaries and bonuses than from the cash throw off on the shares it may hold. Salaries are likely to continue as long as the firm is operating. Retained earnings appear to be a source of capital carrying little obligation. Its use increases the safety and survival chances of the firm. To a conservatively oriented management, keeping the firm alive (and assuring continuing salaries) may appear more worthwhile than keeping the return on the shareholder's investment as high as possible.

A conflict between the stockholders and the company officers over the level of retained earnings can also arise if the management's time preference for future income differs from that of the shareholders'. Or the management may be niggardly with cash outflow because it overestimates the relative profitability of investment in the company with the alternatives open to the shareholders in other areas of the economy.

6.2 Excessively Conservative Financial or Asset Structures

An excessively conservative financial structure has a disproportionate amount of equity financing and relatively little debt. Of course, the degree of conservatism, or risk, in the financial structure must be judged in the light of risks the firm faces. An overly conservative asset structure contains a high proportion of liquid, low-earning assets in relation to the needs of the business. Quite possibly a company could have both an ultra-conservative asset structure and an excessively conservative financial structure. Both conditions are the results of a timorous or greedy management.

An extremely conservative financial structure may develop if all financing is accomplished through new common stock issues. More than likely it is the corollary of a niggardly cash buy back or dividend policy. An ultra-conservative financial structure results if internally generated funds are used to finance the firm to the exclusion of other sources.

A financial structure containing a minimal debt component relieves the management of the fear of failure; however, it raises the cost of capital to the firm. Stockholders are deprived of the extra profits that would accrue through the use of judicious leverage. Indeed, some writers have suggested that a firm should carry some debt as a matter of principle, since it is a constant reminder to the management that there is a cost of capital. The effort and planning required to service the debt should help to keep the managers from becoming complacent.

On the asset side of the ledger, excessive or redundant net working capital is another symptom of an un-enterprising company administration.

A large net working capital base helps assure survival of the firm, but survival without profits is hardly desirable. A firm that does not economize on its use of net current funds, other things being equal, has a low rate of return on its total assets.

Excessive net working capital can develop because of a low payout policy, with the retained funds invested in liquid assets. If a high rate of depreciation is covered by operations and the funds obtained do not go back into capital assets, the same condition results. A firm undergoing a decline in its scale of operations is more likely to have redundant net working capital than one that is vigorously expanding. Nevertheless, the managements of static firms are often reluctant to give up any of the funds they have under their control although they may have no plans for their productive use.

6.3 Expansion

In the shareholders' view, expansion is worthwhile when it increases their reinvested returns. The Gordon Model of stock valuation introduced in Chapter 8 recognizes the importance of reinvested profits and future growth. The use of retained earnings to finance expansion is justified when the company can make the going rate of return on equity on these funds. If the management, however, is not sufficiently concerned about the stockholders, it may pursue expansion for the economic or the psychological rewards that corporation officers receive simply from being associated with a larger firm. The shareholders may well feel that the basic objective of the corporation is sacrificed if the management follows a policy of "dry" or profitless expansion.

In many instances "dry expansion" is a further reflection of the failure of some corporation administrations to recognize the implicit cost of retained earnings. The company may have a consistently low dividend payout rate and fail to find profitable outlets for its funds. Yet the management may be content because it feels that nothing need be paid on the "surplus" portion of the equity. In other cases, the management may tend to overrate investment opportunities in its own firm, or it may do its shareholders a disservice by acquiring subsidiaries at costs which their earnings potential do not justify.

The management's interests and the welfare of the shareholders are not equally served if the company officers bring about profitless company growth purely in order to enhance management prestige, to raise managerial perquisites, or to assuage their power drives.

6.4 Liquidating or Selling the Firm

The natural desire of the company officers to continue operations conflicts with the interests of the shareholders if the foreseeable returns for the firm are not sufficient to cover the value of the capital which can be withdrawn from the firm. The situation is, of course, similar if the company or its assets can be sold as a unit for an amount exceeding the sum of the going market price of its securities. Because a voluntary liquidation or sale eliminates executive incomes, it may well meet with management resistance.

A firm whose common shares sell on the market at a price measurably below their liquidating asset value invites purchase by individuals or syndicates who intend to turn a quick profit by liquidating the company. Such purchasers are often called "raiders" – a term strongly connoting disapproval, especially when used by conservative managements. Nevertheless, the raiders may perform a useful economic function. By their very existence they serve as a warning to those managements who fail to use their capital productively. However the shareholders may not do as well under the raiders as they would were the original management to proceed with a careful and orderly liquidation. Nevertheless, a raid and subsequent liquidation may still be an economic improvement over having shareholder funds slowly go to waste under the aegis of a listless management.

A management that does not wish to give up entirely may turn a liquidated operating company into a closed-end investment corporation (i.e., a company which makes its income by holding other companies' stocks and bonds). For a company having substantial carry forward tax loss credits, becoming a holding company may have some advantages.

7. RISKY ACQUISITIONS

In contrast to a conservative management, a very speculative management may attempt to make a quick fortune by making many rapid acquisitions, obtaining new properties with debt financing, and mortgaging or leveraging the original company to the hilt. Such speculative activities can bring great immediate gains for all, or it can result in the loss of the original equity values in what might have been at the start a small but solid company. The shareholders cannot legitimately complain if they knowingly accept these ventures. However, if the risk-taking proclivities of the management are covered by deceptive practices, the shareholders may have just reason to believe their interests had been breached.

A management holding a plethora of exercisable stock options may be especially tempted to play the stock market for short term speculative gain. Acquisitions must be rationale in that firms with low cash-adjusted leverage, CAL, those attractive as takeover targets, outperform high cash-adjusted leverage firms during the 1980-2003 period by over 11.2% annually. Lower target leverage reduces the liability acquired in the takeover and large cash holdings increase acquirer liquidity. Cash-adjusted leverage is calculated by subtracting cash holdings from debt liabilities. The Cremers, Nair, and John (2005) CAL variable is calculated as (debt – cash)/ total assets. The acquired firm's cash holdings can pay off the firm's debt, a concept very similar to the net current asset value (NCAV) concept of Graham and Dodd introduced in Chapter 14.

8. TURNING AGENTS INTO OWNERS

The prescribed method for dealing with the Agency/Principal problem is to set up the compensation system so that the interests of the Agent are closely tied to that of the principal. Various devices have been developed so that at least part of the managerial compensation is based on the financial performance of the firm. At least a portion of the management's income is based on their being part or quasi-owners in the firm.

Illusory growth takes place when, in evaluating a stock, investors concentrate on an apparent periodic increase in earnings per share without checking on or correcting for the trend of the rate of earnings on total assets or the so called core business. The true measure of growth is the earnings after the acquisition rise over the projected earnings of the company's independence. The phenomenon of illusory growth is developed by the use of acquisitions or mergers after the acquiring company has somehow been initially recognized as a growth company by the market.

The easiest way to explain illusory growth is by example. Suppose we have Athos Corporation, with 100,000 shares outstanding, earning $1.00 a share, currently selling at $20.00 per share (a P/E ratio of 20 times earnings) because of a market belief in a past record of growth. Athos' total earnings is $100,000. Another firm, Zanox Inc., has 100,000 shares outstanding, an BPS (earnings per share) of $1.00, and is considered a moderately successful firm selling at \$10.00 a share (a P/E ratio of 10 times earnings). Zanox also has total earnings of \$100,000.

Athos now acquires Zanox by an exchange of Athos's shares for Zanox's on a value-for-value basis. One share of Athos (\$20.00 per share) is exchanged for two \$10.00 Zanox shares. (In the process the Zanox shares are retired.) At the end of the transaction, Athos has 150,000 shares outstanding, but it has added \$100,000 to its earnings, bringing the total to \$200,000. Dividing through by the new number of shares, \$200,000 divided by 150,000 total shares, now gives us an EPS of \$1.33. Lo and behold, Athos has raised its earnings per share by 33.0 percent. It may be now further confirmed in its reputation as a growth company, and its high P/E ratio justified.

Eventually, the illusory growth firm disappoints its investors and the price of its shares drops sharply. As the original growth company merges with more and more average or slow growth firms, the growth rate of earnings on the total asset base must begin to decline. Externally, it becomes more and more difficult to find net new desirable acquisitions, and internally, the managerial problems of the conglomerate become unwieldy. But more basically, a simple mathematical relationship begins to undermine the whole process of illusory growth. When the original company was relatively small, the acquisition of another fair-sized company on the basis of a favorable relationship of P/E ratios, raised the EPS of the acquiring company noticeably. When the so-called growth company reaches a large size, it requires larger and larger acquisitions to maintain the picture of rising earnings per share.

Again, a small example may illustrate the problem. Suppose Athos Conglomerate Inc. now has 2,000,000 shares, \$2,000,000 of earnings (EPS of \$1.00), and because of a growth reputation sells at \$20.00 per share (P/E of 20X). Silon Corporation has 100,000 shares, earnings of \$100,000 (EPS of \$1.00), arid a moderate price of \$10.00 per share (P/E of 10X). Athos acquires Silon through an exchange of shares, value for value, one share of Athos for two of Silon. After the acquisition, Athos has total earnings of \$2,100,000 and total shares outstanding of 2,050,000. The earnings per share goes up from \$1.00 to \$1.024; but this is hardly a noticeable increase and nowhere near what its followers have expected from Athos in the past. In short, as the illusory growth company becomes larger and larger, it begins to outgrow its environment. It requires larger and larger acquisitions to maintain the appearance of earnings growth, and new gulps of these sources of financial nourishment might not be as available as they were earlier in the conglomerate's career.

Finally, as the investors become disillusioned, a more reasonable P/E ratio is given to the stock and the price of the ,shares fall sharply. The last round of buyers may experience severe losses on their holdings. Illusionary growth was behind many of the recent financial scandals.

9. THE DISECONOMICS OF FINANCIAL SCAMS

From a broad point of view, management perfections and frailties are but small glitches in the functioning of the financial markets. Yet they do entail a cost. The unnecessary volatility they add to the markets, the risk of loss because of fraudulent or near-fraudulent behavior, adds to the risk premium carried by the economy's cost of capital. The rise in the cost of capital reduces worthwhile real investment and slows the rate of economic improvement and growth. Moreover, the incidents of wild behavior or outright crookedness bring forth a strong social/psychological reaction of anger and resentment so that some reasonable and normal operations or innovations are mistrusted and hindered. This reaction adds friction and inefficiencies to the function of the financial markets.

The operations of the financial and capital markets are an essential element in the functioning of a free enterprise, price directed economy. Yet in many ways, the financial markets are fragile institutions; in a large part, their operation is made possible only by a considerable degree of trust between the suppliers and users of funds. (In the current scholarly literature, this connection has been extensively examined under the heading of *agency-principal relations*.) Insofar as fake-out devices lead to a waste of resources, a reduction of trust, and the subsequent employment of more elaborate examining and policing devices, they impose an extra cost on the overall cost of capital.

10. INSIDER TRADING

The chief officers of a corporation, the directors, and major stockholders are in a position to obtain advance information on important developments in the company. Such "inside" information, whether favorable or unfavorable, can easily be turned into quick trading profits on the stock market.[10] Clearly unethical would be an insider program to create speculative activity by placing tips and financial news in the market or by actually manipulating financial reports and the timing of financial announcements.

The Securities Exchange Act of 1934 substantially restrained the possible speculative activities of management and other insider groups. No longer can such groups operate secretly; any changes in the shareholdings of corporation officers, directors, and major stockholders must be reported, and these changes are published weekly by the Securities and Exchange Commission. Prison terms and/or substantial fines may await insiders guilty of deliberately leaking information or of engaging in other manipulative practices. Bettis, Coles, and Lemmon (2000) surveyed some 1900 member firms of the American Society of Corporate Secretaries in November 1996 with regard to corporate insider trading restrictions. Some 35% of firms (633) responded to the survey. Of the firms responding to the survey, 576, or 92%, had corporate policies regulating or restricting insider trading. The most common policy, involving approximately 75% of the sample, required prior approval of insider trades. Moreover, most companies had blackout periods. Blackout periods are periods during which trading by insiders is not allowed. The most common blackout period was 10 days, generally days +3 through +12 of quarterly earnings announcements. Bettis, Coles, and Lemmon (2000) find that blackout days reduce the bid-ask spread by two basis points, or 8.5%, and insider trading profitability is less in blackout periods than in trading windows during the 1992-1997 period. Insiders earned abnormal profits in allowed trading windows of 0.58%.

10.1 Conflict of Interests

No legal rule prohibits company officers or directors from dealing with the corporation on their own account, nor from having the corporation contract with other companies in which they have a personal interest. The interest of the corporation official must be fully disclosed, however, and the transaction must be open. A company official who has a concealed interest in another firm which is a supplier or customer of the corporation is in an especially vulnerable position. A corporation officer who has profited personally at the expense of the company is subject to suit by the corporation or by stockholders on behalf of the company. Major corporation officers should divest themselves of conflicting interests or at least abstain from participating in decisions when these interests are involved.

11. STOCKHOLDER REMEDIES

What can the stockholder do if his management seems incompetent or flouts his basic economic interests? A number of alternatives have been suggested, although none of them appear to be entirely efficacious.

Sell His Shares Some authorities advise the unhappy stockholder to sell his shares. This is the so-called practical approach. It ignores the fact that although this course of action may work for one shareholder, if any large part of the shareholders attempt the same remedy, the price of the stock would drop sharply on the market, entailing a considerable loss for all the stockholders. The management would suffer only insofar as they held any shares themselves.

Institute a Stockholder Suit A stockholder suit is valid only if the management has been guilty of breaching its quasi-fiduciary position. It will not hold for many of the situations described in this chapter. In addition, stockholder suits are difficult and expensive. The mores and culture of the investment community frown upon them; and indeed even shareholders who have benefited by the successful outcome of a "derivative" suit[11] often look askance upon the shareholders who instituted the action. It is true that the remedy of the stockholder suit has often been abused; some shareholders have used it to further their own special interests. Nevertheless, it is a salutary device even if its existence – the possibility of a suit – serves only to remind the management of the limitation of its powers.

Attend and Vote at Annual Stockholders' Meetings The vast majority of shareholders do not attend the annual meetings. But, contrary to common belief, it is possible (assuming a responsive management) to have considerable influence at these meetings. Intelligent, incisive questions force the management to consider their policies carefully. Independent stockholder proposals can be submitted at the annual meetings. These proposals are usually voted down by an overwhelming majority, but if the proposals pick up support from one year to the next, they exercise considerable impact on a responsible management.[12] Many such independent proposals are eventually adopted by management itself.

Organize a Proxy Fight to Vote Out the Management If the stockholder is sufficiently outraged by the management, he may attempt to vote in a new board of directors who will appoint a new management at the shareholders' annual meeting. The shareholder can succeed only if he can enlist a majority of the voting stock in his campaign. The management has all the advantages of the "ins" in such a struggle. It has better access to the mailing list of stockholders, to whom it can send proxy requests.[13] It can use company funds and personnel to help run its proxy solicitations, and can count on a considerable number of proxies that are almost automatically returned to the management.

Indeed the smaller "independent" stockholder can scarcely hope to win a proxy fight. Even if he finds himself allied with some powerful financial interest seeking to gain control of the management, the outcome is uncertain. And, indeed, in such a case, it may be better to stay with the old management.

"Respectable" entrenched managements look upon the organizers of proxy fights (even when they may represent major, responsible shareholders) with disfavor. The insurgents are called "raiders." Nevertheless, a successful management seldom faces a proxy fight. Indeed, an occasional proxy fight probably does the investment community no harm, but rather encourages incumbent managements to seek improvement in their stockholder relations.

12. TO WHOM IS MANAGEMENT RESPONSIBLE?

Social minded writers have long called for the arrival of a new type of management, one concerned with economic and social justice.[14] Management's primary concern would no longer rest with the maximizing of profits – i.e. with the economic interests of the shareholders. Because the "separation of ownership and control" is largely an accomplished fact, the corporation administrators have acquired tremendous powers independent of any likely stockholder interference. They should, therefore, devote themselves largely to deciding "fair prices," to developing pleasant communities, and to determining "just wages." The exponents of such developments seem not to fear that the corporate managements will abuse their powers. They feel that a properly trained manager would acquire an ethic of self-discipline or, better, of self-restraint, which could be relied upon to moderate any undue selfishness of the managerial groups.

To the more orthodox scholars of economics and finance this sociological derived thesis seems somewhat romantic. It is doubtful whether the widening area of managerial independence represents a complete divorce from the dominant interests of the risk-taking suppliers of ownership capital, which is to maximize the value to its owners.

It is questionable that even if it is granted that benevolent corporation administrations are free to make their own economic policy, whether it is desirable that they do so. No matter how fine the ethics and social sensibility of the managers, is it wise to encourage them to believe that they should make decisions that transcend the market? This argument should not be misinterpreted. We can agree that managers should be honest, ethical, and law-abiding and that they act within the framework of accepted social standards. (In this we ask no more of management than of other potent movers of our society, labor leaders, government officials, religious leaders, reporters, and educators.) As a matter of enlightened self-interest, management should not debase their product, produce unworkable or dangerously defective goods, put men to work under unsafe or unsanitary conditions, cheat on taxes, advertise falsely, or engage in collusive marketing practices. On the positive side, the management of large corporations can practice good community relations, contribute to worthwhile public or educational projects, engage in good labor practices, encourage cultural and intellectual development, and the free exchange of ideas in the community. Nevertheless, these are not the main activities of corporation managements. They should not consider themselves the dispensers and allocators of benefits to the rest of society, for nothing could be surer to raise the resentment of the rest of the citizenry. Independent men will tend to dislike being beholden to feudalism-even a benevolent feudalism.

Lastly, the “new capitalism” implies a denigration of the economic function of management. Maximizing the long-run profits of the firm, in this thesis, becomes a crass money-grubbing activity. There is a considerable lack of appreciation of economic analysis in this view. Management performs important economic functions when it bargains hard but honestly. Management must use the criterion of economic efficiency if factors of production are not to be wasted or misemployed, if productivity is to be improved, if the investment of new capital is to be directed to areas where it is most needed, and if, to sum up, a system of free market prices is to work at all. As we discussed in Chapter 1, management must work to maximize stockholder wealth.

Notes

[1]Nevertheless, divergences of interest can exist in family-held companies. For example, a family member holding shares chiefly for their yield and a family shareholder drawing an income mainly from his managerial activity may differ on what is best for the company. Such conflicts are generally settled intramurally, although on occasion they have gone to court.

[2]Adolph Berle and Gardiner C. Means, *The Modern Corporation and Private Property*, MacMillan, 1933.

[3]J.R. Emshwiller and J.S. Lublin, "Boardrooms, 'Independent' is Debatable," *The Wall Street Journal*, March 3, 2005, C1, C4.

[4]Mr. Benjamin Graham writes "The typical management is honest, competent, and fair-minded." *Intelligent Investor*, Harper, 1959, p. 222.

[5]Some people think that all corporation managements are dishonest. Then, of course, others think all government officials are grafters, all policemen are bribe takers, all union leaders gangsters, and all professors time servers. People who have these cynical and essentially narrow beliefs rarely suggest meaningful policies for a democratic society.

[6]Berle and Means, op. cit.

[7]See Chapter 19.

[8]Even a highly paid executive may find it difficult to save as much as he would like. A pension plan represents a method of forced or involuntary saving.

[9]A complicating factor in valuing future returns may be the differing tax status of the individual shareholders. A stockholder with a high marginal present tax rate may prefer increased future dividends and growth over present returns. If the dividend policies are consistent in pattern, probably each firm eventually acquires stockholders of appropriate tax status.

[10]Trading profits can be made on unfavorable developments, which would tend to depress the price of the stock, by "selling short."

[11]The stockholders' action is called a "derivative" suit because they sue on behalf of the corporation.

[12]Unfortunately, the notion of the "divine right" of management is so imbedded in the investment community's thinking that the questioning, active, independent shareholder must often expect to arouse some hostility – mostly from his fellow shareholders.

[13]A proxy is a grant to a designated person to vote one's stock if one cannot attend the meeting. Proxies can be requested for voting on the membership for the board of directors or for voting on specific proposals. The SEC requires full disclosure of the issue on the solicitation of the proxies.

[14]See Adolph Berle and Gardiner C. Means, Op. Cit. (especially the last chapter). In this book Berle merely hoped for the day when management would mediate between the stockholders, the public, and labor. In a later book, *Twentieth Century Capitalist Revolution*, Harcourt, Brace and World, 1954, he is deceptively pleased that that day had arrived.

[15]As the authors updated this chapter and this text went to press, the relative Domini 400 Social Index returns were trailing the S&P 500 Index as August 31, 2006.

Time Period Returns

Stocks	Year-to-Date (%)	One Year	Three Years	Five Years	Ten Years	Since Inception
DSI	3.43	6.24	9.04	4.07	9.17	11.73
S&P500	5.80	8.88	10.95	4.65	8.92	11.08

Source: www.kld.com/performance

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Appendix I

SOCIALLY RESPONSIBLE INVESTING

During the 1990s, many investors sought to invest in securities that were "socially responsible." There are, of course, many definitions of socially responsible investment (SRI). For example, in May 1990, the Domini 400 Social Index (DSI) was created to replicate the returns of the Standard & Poor's 500 (S&P500) Index. The Domini 400 Social Index was created by Kinder, Lydenberg, and Domini (KLD) to select companies with positive social and environmental records: the criteria involved community relations, diversity, employee relationas, human rights, safety, environment, and (new) corporate governance. The DSI's social criteria led it to exclude stocks that: (1) derived more than two percent of gross revenues from military weapons; (2) firms with tobacco, gambling, and alcohol sales; and (3) firms that own or share in nuclear power plants. The returns of the DSI stocks have exceeded the returns of the S&P 500 stocks since 1990, although there is a beta bias (exceeding 1.0) and a growth bias to the DSI portfolio. The relative returns of the DSI and S&P 500 stocks, as of August 30, 2003 have been:

Time Period Returns

Stocks	Year-to-Date (%)	One Year	Three Years	Five Years	Ten Years
DSI	16.46	14.05	-10.96	3.09	10.91
S&P500	15.93	12.07	-11.41	2.51	10.09

Recently, the relative performance of the DSI stocks has been negative. If one examines relative performance as of July 2007, one finds:

	Year-to-Date	One Year	Three Years	Five Years	Ten Years	Since Inception
DSI	2.34	15.59	9.51	10.65	5.92	11.82
S&P500	3.64	16.13	11.76	11.81	5.98	11.27

Source: www.kld.com/newsletter/archive/press/pdf/

The relative returns on SRI portfolios can be volatile.[15] There can be additional social criteria. One may not want to invest in stocks with poor environmental records, or poor employment (unions, safety, pension concerns), or diversity (woman and/or minority CEO, or boards of directors, family or "gay" rights, hiring of disabled persons) records. There can be an almost infinite number of combinations of social criteria exclusions that can be used to create SRI portfolios. Do these social criteria affect portfolio performance and stock prices? The recent empirical evidence, as reported in studies winning the Moskowitz Prize for Research in Socially Responsible Investment, supports the notion that SRI portfolios do not perform statistically different from (traditional) equity portfolios and stock prices of socially responsible stocks are not determined by different criteria than commons tocks in general. The Moskowitz Prize winning studies are Guerard (1996), Waddock and Graver (1997), Russo and Fouts (1998), Repetto and Austin (1999), Dowell, Hart, and Yeung (2000) and Bauer, Koedijk, and Otten (2001). There is no statistically significant cost of capital differences in the SRI stocks and non-SRI stocks.

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