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Relationship between Price and Rent in the Real Estate Market and Stability Analysis: A Theoretical Approach

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ABSTRACT

In recent times, volatility in the housing market has become an issue of great macroeconomic concern. Various efforts have been made to detect existence of bubbles and estimate their severity. The present study attempts to find out the possible economic reasons behind housing market instability and to understand the role of a regulatory authority in arresting the same. The study finds that there are possibilities of a housing market being stable in the sense that it attains stability by itself. A regulator's role becomes important when a market does not follow a self-corrective model to reach equilibrium by itself. If, however, the regulator can once successfully place the market on the stable path, it by its own reaches equilibrium and does not move further until some exogenous shock disturbs the system.

Keywords: House Price, Rent, Buy-to-Reside, Buy-to-Invest, Saddle Path, Stability Analysis.

JEL Classification: R31

1. INTRODUCTION

Development in the housing market affects economic development. In an economy where vast majority of individuals own houses, housing is a significant component of household wealth. Thus, as house prices rapidly increase there may be a positive "wealth effect" as households see their wealth rise. This is likely to encourage households to increase spending for two reasons. Firstly, people can re-mortgage their house, that is, borrow more money against the increased value of the house which can then be spent.

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Also, rising house prices are likely to increase consumer confidence and therefore consumer spending will rise. This in turn causes aggregate demand to rise. Similarly a regressive movement in house price will adversely affect aggregate demand and output.

As a result of this interdependence unpredictability of the housing market is transmitted to the goods market. It has been because of this phenomenon that crisis in the housing market in US and across the world since August 2007 has spilled over to the real sector resulting in economic recession. The primary cause of the recession has been interaction of the asset price bubble with the new kinds of mortgage market financial innovations, with compa-nies failing to follow their own risk management procedures and with regulators and supervisors failing to restrain excessive risk taking and the belief that 'this time it's different'.

Following this recession, 2008 and early 2009 have been turbulent years for real estate companies. However, the emerging economies where, the highly complex asset securitization is lacking, have been relatively unaffected even in the world of financial integration. Such a global meltdown could have been avoided if the investment decisions in the housing market (whether guided by profit motives or buy-to-reside motives) were based on fundamentally correct economic rationale. Stated alternatively, if the micro level investment had been based on cost-benefit analysis given the demand-supply conditions rather than by runaway buying frenzy/excitement in the market, the asset bubble would not have arisen at the first place.

The objective of the present study is to provide a rule as a guide to investors in the housing market. The model attempts to capture the demand side factors via price, rent and interest rate dynamics as data available for most economies show that the available stock of houses at any point of time is in excess of the demand for houses. It considers the behavioral difference between first time buyers and experienced buyers of houses to arrive at the equilibrium condition. Thereafter it èxplains the transition process to reach equilibrium and hence stability analysis.

The paper is divided into five sections. Section 2 is a literature review; Section 3 presents a price-rent relationship model; Section 4 deals with stability analysis and hence the role that a policy maker can play in equilibrating the market followed by the conclusion in section 5.

2. LITERATURE REVIEW

Recent trends in the housing market have caused many to believe that there is a bubble in current housing prices. How does one tell when rapid growth in house prices is caused by fundamental factors of supply and demand and when it is an unsustainable bubble? Stiglitz (1990) provided a general definition of asset bubbles: "If the reason that the price is high today is only because investors believe that the selling price is high tomorrow — when 'fundamental' factors do not seem to justify such a price — then a bubble exists. At least in the short run, the high price of the asset is merited, because it yields a return (capital gain plus dividend) equal to that on alternative assets." (Stiglitz 1990, p. 13).

Stated alternatively, a bubble occurs when the rate of appreciation of home prices becomes irrational and does not depend on solid economic factors (economic fundamentals). In order to understand the underlying working of recent trends we can calculate the appreciation in the market and explain it through fundamentals. After estimating a strong fundamental-driven model, the left-over variance can be interpreted as the maximum that the bubble process could contribute to market movements.

Thus, in order to understand the price trends in any housing market over the years, it is first required to look at factors affecting housing prices. Analysis of such factors varies over time and across economies. Keeping these constraints in mind we divide the literature survey into two sub-sections. Sub-section 2.1 visits papers highlighting empirical findings across different countries and sub-section 2.2 surveys articles focusing on the importance of price-rent ratio in determination of real estate prices.

2.1 Empirical Findings

A University of Chicago study (Topel and Rosen, 1988) thought of housing as an investment and constructed a supply-determined model of housing investment in the United States (US). Another study of US data during the same period across the metropolitan housing markets, by Abraham and Hendershott (1994), found that the construction costs, employment growth and income growth are significant in predicting housing prices. Jud and Winkler (2002) found that real housing price appreciation positively responds to population growth, income, construction costs and negatively responds to real interest rate.

In an interesting attempt, using impulse response analysis for Greece during 1981–1990, Apergis and Rezitis (2003) found that housing loan rate is an important variable with highest explanatory power for the variation of housing prices, followed by inflation and employment. Bourassa's and Hendershott's (1995) study of real house prices in Australian capital cities found cyclical house price behaviour, and a rapid increase in the house price to GDP per capita ratio in all cities excepting Darwin.

Analyzing the determinants of housing price in Australia during the period 1970-2003, Abelson et al. (2005) found that in the long-run housing prices are related positively to real income and inflation rate and negatively to unemployment rate, mortgage rates, equity prices, exchange rate and housing stocks. Krugman's column issued in New York Times on housing prices and geography published on January 2, 2006, suggests that in parts of US where there is scarcity of land, rise in house prices is not much justified by economic fundamentals. As a result, there has been fall in the affordability of houses which cannot be restored by reducing interest rate as they are already low, given the historical levels.

2.2 Price-Rent Ratio in Determination of Real Estate Prices

The house price-rent ratio is widely used as an indicator of over and undervaluation of the housing market. These are the traditional house-price models based upon the literature of inter temporal asset pricing (Muth, 1960).One summary measure which uses the price to rent ratio (the nominal house price index divided by the rent component of the consumer price index) is the Asset-pricing Approach to get an indication of over or undervaluation. When house prices are too high relative to rents, potential buyers find it more advantageous to rent, which should, in turn, exert downward pressure on house prices. It has to be assessed against the evolution of the user cost of home ownership, which takes account of the financial returns associated with owner-occupied housing, as well as differences in risk, tax benefits, property taxes, depreciation and maintenance costs, and any anticipated capital gains from owning the house. Equilibrium in the housing market occurs when the expected annual cost of owning a house equals that of renting, while overvaluation is characterized by an actual price-to-rent ratio greater than that calculated with the user cost, suggesting that it is cheaper to rent. The user cost of housing is calculated following a method proposed by Poterba (1992) which includes components like the after-tax nominal mortgage interest rate, tax deduction or credit of mortgage interest, property tax rate and the expected capital gains (or loss).

In equilibrium, the expected cost of owning a house should equal the cost of renting. Comparison is made between the actual price-to-rent ratio with that based on the user cost of housing over the past ten years. The difference between the two series may be considered as an approximate indicator of overvaluation. A pitfall with this measure, based on a long-run concept (the desired price-to-rent ratio), ignores expected shorter-run movements in the variables that make up the user cost, which could potentially narrow the gap between the two series. Short-run dynamics in housing markets can have powerful effects on house prices. Ortalo-Magné and Rady (2005), for example, using a life-cycle model, showed that changes in income of credit-constrained homeowners can lead to sharp price movements. A similar analysis by Valverde (2010) emphasized that housing market equilibrium is determined by the equality between its expected profitability (approximated from the rental price) and the profitability of alternative investments. Ayuso and Restoy (2006, 2007) developed such an intertemporal asset pricing model in the context of Spain. As far as the Spanish case is concerned, Pagés and Maza (2003) used an error correction model, where real income and nominal interest rates are posited as the main variables explaining the evolution of housing prices.

Recent discussions of house price movements by Yong (2008) focused on the determinants of rent-price ratios. The central message of the paper was that rent-price ratios do not proxy the earnings yield of owner occupied housing, and the recent decline in the rent-price ratio need not be related to unusually high expected rates of price appreciation.

Despite the widespread use of the price-rent ratio as a key housing market statistic, surprisingly little is known about the theoretical relationship between the price-rent ratio and market fundamentals such as interest rates, income, down payment requirements. A paper by Sommer, Sullivan and Verbrugge (2010) developed a dynamic equilibrium model to explore this theoretical relationship empirically. The model focused on the relationship between the steady state house price-rent ratio and fundamentals such as the interest rate, required down payment, and income.

3. PRICE- RENT RELATIONSHIP IN THE HOUSING MARKET: A THEORETICAL APPROACH

The present study attempts to obtain equilibrium condition in the housing market which depends on buying and selling decisions taken by participants. Data available on most economies show that there is always an excess supply of houses. In such an economy, movements of demand side factors can be used to gauge stability condition in the market. These factors include price, rent, interest rate on housing loans, interest on alternative investment opportunities etc.

At the micro level, demand for houses comes from two sources:

- Individuals buying a house to reside (first time buyer)
- Individuals buying a house as an investment (experienced buyer)

The economic decision making process for the two groups will be different since the former buyers view it as an essential good while the latter look at it as a profitable venture to invest. Thus, modeling the two sides separately and then combining them gives the demand side picture of the real estate market. Modeling the behavior of the first group of people is made in sub-section 3.1 and sub-section 3.2 models the case of the second group.

Let there be a regulator who decides house price and rent at the beginning of each period depending on which individuals take their investment decisions, i.e., an individual is too small to affect macro variables. Thereafter the regulator does not intervene and the price-rent movements are left on the market forces for the rest of the period. At the beginning of the next period, he again supplies a new set of price and rent. Alongside, interest rates are also exogenously supplied. For simplicity, it is assumed that there are no transaction costs and taxes.[2]

3.1 Buy-to-Reside

Individuals who do not own a house take loans to buy houses to reside and repay it within an agreed time period. To keep things simple, we assume interest rate is fixed for the loan period, installments are same across periods and there is no initial down-payment. Repayment begins from the next period.

It is a common notion that experience pays dividends when it comes to dealing with market uncertainties. To distinguish between the first time buyers and the experienced buyers we assume that experienced buyers have more accurate perceptions about the market and form expectations accordingly, whereas, first time buyers are short-sighted. They cannot see beyond the very next period. They decide to buy a house today if buying tomorrow is costlier, otherwise stay in rent for today. Tomorrow (next period) they will repeat the same exercise as then they will be comparing cost of buying a house tomorrow with that of the day after tomorrow. Thus, by virtue of their limited market knowledge they cannot foresee more than one period.

In any period, a person who does not own a house decides whether to purchase a house or stay in rent in two stages:

- He finds the optimum loan period given the interest rate for the period.
- He compares the costs of buying a house today with the expected cost of buying tomorrow. He buys today if buying tomorrow seems to be costlier otherwise waits for tomorrow and stays in rent for today.

An individual who plans to buy a house takes a loan equal to the full amount of the house price (P). That is, Loan amount = P. The amount to be repaid in N periods is therefore (P + PNr) where r is the interest rate on loan. Each installment amount is then (P + PNr) / N. Repayment starts from the next period. Thus, discounted value of the cost of buying a house in that period is,

$$\begin{aligned} DPV_L &= \rho\ (P + PNr) / N + \rho^2\ (P + PNr) / N + \ldots\ldots\ldots\ldots\ldots\ldots + \rho^N\ (P + PNr) / N \\ &= [\rho P\ (1 + rN) / N]\ [(1- \rho^N) / (1- \rho)] \end{aligned}$$

where DPV_L is the discounted present value of the loan and ρ is the discount factor and is equal to $1/(1+r_1)$, r_1 being the per period interest rate offered on a risk-free asset. Now,

2 The 'regulator' is introduced in the model to take away the power of influencing the prices from the individual buyers/ investors. Even the free market forces can play this role given its dynamics are beyond individuals' control. The attempt is to model one of the many small sectors of the bigger real estate market with the assumption that functioning of all these sectors collectively set the prices at the beginning of each period (the financial year for example).

he chooses N to minimize the cost. So, the buyer chooses the largest N institutionally allowed. Thus, for a particular economy we can take N to be a constant. For instance, in US it is generally 15 years.

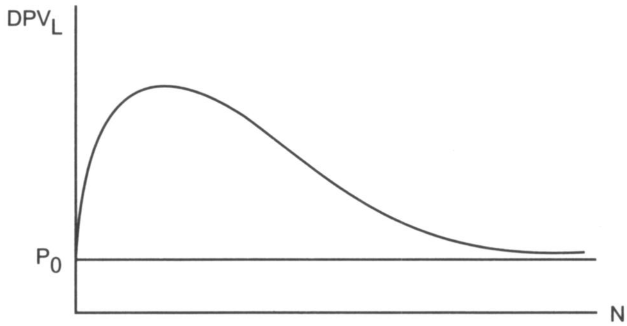

Figure 1: DVP_L Curve across Periods of Repayment of Loan

In the second stage, he compares DPV_L of today with that of tomorrow. Repayment starts from tomorrow. Thus, cost of buying the house today is,

$$(DPV_L) = \rho(P_0 + P_0Nr)/N + \rho^2 (P_0 + P_0Nr) / N + ... + \rho^N (P_0 + P_0Nr) / N$$
$$= [\rho P_0(1 + rN) / N] [(1- \rho^N) / (1- \rho)]$$

Cost of buying the house tomorrow,

(DPV_L) = Rent a house in current period + present value of the cost of buying house in first period

$$= R_0 + \rho^2 P^f_1 (1+ rN) / N + \dots\dots + \rho^{N+1} P^f_1 (1+ rN) / N$$
$$= R_0 + [\rho^2 P^f_1 (1+ rN) / N] [(1- \rho^N) / (1- \rho)]$$

At equilibrium, the two costs are equal:

$$[\rho P_0 (1+rN) / N] [(1- \rho^N) / (1- \rho)] = R_0 + [\rho^2 P^f_1 (1+ rN) / N] [(1- \rho^N) / (1- \rho)] \quad ...(A)$$

If LHS > RHS: Individual rents in 0^{th} /current period. As a result, rental (R_0) rises and price (P_0) falls. Therefore equality is restored. If LHS < RHS: Individual buys house in 0^{th} period. This causes price (P_0) to rise and rental (R_0) to fall. Therefore equality is restored.

From (A): $P_0 = [N(1- \rho) / \rho(1+rN)(1- \rho^N)]R_0 + \rho P^f_1$

In general: $P_t = [N(1- \rho) / \rho(1+rN)(1- \rho^N)]R_t + \rho P^f_{t+1}$

or, $P_t = \lambda R_t + \beta_t$ ...(B)

where $\lambda = [N(1- \rho) / \rho(1+rN)(1- \rho^N)]$

and $\beta_t = \rho P^f_{t+1}$

Diagrammatically, the market curve for buy-to-reside individuals is as follows (Figure 2). It is called RR, represented by equation (B).

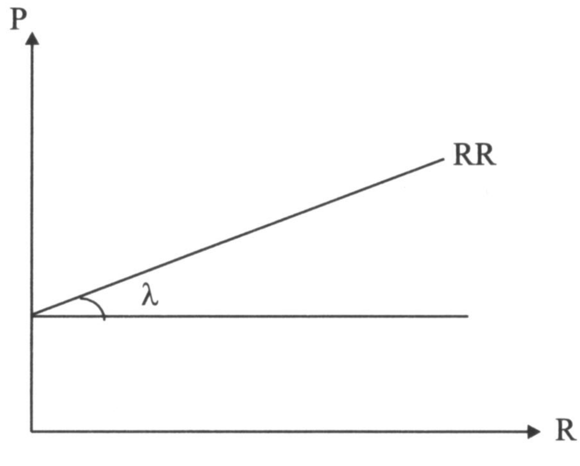

Figure 2: Buy-to-reside Market Curve

The intercept is ($\rho\ P^f_1$).The curve is RR. It is a positively sloped line with slope λ such that $\lambda = \lambda(r)$, $\lambda' < 0$. This implies that as r rises, for given rental, price should fall.

3.2 Buy-to-Invest

Investors face different investment options. Let there be two options in this time. Investors can either invest in a risk-free treasury bill with M periods of maturity at a fixed rate r_s or they can invest in the housing market where returns are uncertain. Investment option in the housing market is of the following form: The investor buys a house, rents it out for this period and from the next period he/she tries to sell it if profitable. If not he/she rents it out again for the period and waits for the next period. To be able to compare between the yields from the two options we calculate the return from the t-bill if P_0 amount of money is invested (since to invest in housing market, he/she had to invest P_0) and the expected return from an investment in the housing market over M periods (since to invest in t-bill, he/she had to wait for M periods for it to mature) with the restriction that if the house is not sold till the $(M-1)^{th}$ period, it must be sold at the M^{th} period at the prevailing market price. For simplicity, it is also assumed that the house is sold at the first profitable opportunity i.e. when for the first time the discounted value of the house price exceeds the current price, P_0.

At the beginning of each period the investor compares between the return from investment in the t-bill with that of the expected return on investment in the real estate market. For investment in houses, in the current period, after purchase the house is rented. Thus earning in this period is R_0. The discounted present value from investment in real estate (DPV_h) for M periods is,

$(DPV_h) = R_0 + \rho\ ER_1 + \rho^2\ ER_2 + \ldots\ldots.. + \rho^M\ ER_M$, where ER_i is the expected revenue in the ith period. Alternatively, P_0, the price of the house in the current period can be invested at the given interest rate (r_s) on t-bills for M periods to yield, $P_0(1 + r_M M)$, where r_M is the rate of interest for M-period maturity t-bills. Thus, $(DPV_{alt}) = P_0 (1 + r_M M)\,\rho^M$. The individual is indifferent between the two types of investment when $(DPV_h) = (DPV_{alt})$. Therefore, at equilibrium,

$$R_0 + \rho ER_1 + \rho^2 ER_2 + \ldots\ldots + \rho^M ER_M = P_0 (1 + r_M M)\rho^M$$

This is the story of the two groups operating in the market. The behavior of these two types of investors put together gives the demand side picture of the housing market. Combining them we obtain the decision rule of when a house will be sold and when it will be rented.

A seller will sell the house only if it covers the cost of his purchase. Stated alternatively, to ensure himself/herself a minimum profit, he/she sells the house only if the present value of the earning is at least as great as the cost of purchasing the house. That is, in general, present value of the earning from sale in i^{th} period $\geq P_0$

or, $\rho^i P_i \geq P_0$

or, $P_i \geq (P_0 / \rho^i)$ ...(C)

This is the seller side condition. An investor makes sure before investing that his expectation about future prices satisfies the condition i.e. $P^f_i \geq (P_0 / \rho^i)$

On the other hand, a buyer will purchase the house if it is cheaper to buy than to rent in the concerned period. So, for the i^{th} period, a buyer buys the house if

$P_i \leq \lambda R_i + \beta_i$ [This follows from equation (B)] ...(D)

This is the buyer side condition.

A house will be sold in the i^{th} period if the demand side condition and supply side condition are simultaneously satisfied. Combining (C) and (D), therefore, we obtain the condition for a house to be sold in the i^{th} period as,

$$(P_0 / \rho^i) \leq P_i \leq \lambda R_i + \beta_i \qquad \text{...(E)}$$

and the house will be rented if,

$$P_i > \lambda R_i + \beta_i \qquad \text{...(F)}$$

The buy-to-sell investor must take the investment decision in the current period and act accordingly. So the next question that arises is how the investor estimates his/her (future) expected revenue earnings from the house. Revenue from the i^{th} period arises only if the house is not sold till the $(i - 1)^{th}$ period. Thus expected revenue in the i^{th} period (ER_i) is

$ER_i = [p_{iB} P^f_i + p_{iR} R^f_i]$ x probability {house not sold till the $(i-1)^{th}$ period}

where p_{iB} = probability of house being sold in the i^{th} period, and,

p_{iR} = probability of house being rented in the i^{th} period

An experienced investor also knows that bank loan interest rates are not the same across all periods. But he does not know the actual mechanism through which it is determined. Thus, he considers interest rate to be a random variable and tries to estimate the distribution it follows. He calculates p_{iB} and p_{iR} based on his expectations about future prices and rents i.e. he expects P_i to be P^f_i and R_i to be R^f_i for all future period i.

For the house to be sold, inequality (E) must be satisfied. That is, p_{iB} = probability $[P^f_i \leq \lambda R^f_i + \beta_i]$; since $P^f_i \geq (P_0/\rho^i)$. For the house to be rented inequality (F) must be satisfied. That is, p_{iR} = probability $[P^f_i > \lambda R^f_i + \beta_i]$

$ER_M = P^f_M$ x probability {house is not sold till the $(M-1)^{th}$ period}

Stated alternatively, a house will not be sold in the j^{th} period if the seller does not receive his minimum reservation price i.e., $[P^f_j < (P_0/\rho^j)]$ (which is ruled out by assumption) or if the buyers find it cheaper to rent i.e., $[P^f_j > \lambda R_j + \beta_j]$. Combining these two conditions we obtain the probability of the house not being sold in the j^{th} period as

$$= 1 - p_{jB}$$

$$= 1 - (\text{probability of house being sold in the } j^{th} \text{ period})$$

$$= p_{jR}$$

With expected revenue in each period the investor decides whether the return is higher in the housing market or in the alternative investment venture.

At equilibrium: $(DPV_h) = (DPV_{alt})$

or, $$R_0 + \rho ER_1 + \rho^2 ER_2 + \ldots\ldots + \rho^M ER_M = P_0(1 + r_M M)\rho^M$$

If LHS > RHS, housing market investment yields higher profit and demand for houses rises. This results in a rise in current house price (P_0). If LHS < RHS, the alternative investment opportunity is relatively more profitable. Thus, demand for houses fall and P_0 falls.

In general, $R_t + \rho ER_{t+1} + \rho^2 ER_{t+2} + \ldots + \rho^M ER_{t+M} = P_t(1 + r_M M)\rho^M$

or, $P_t = [1/(1 + r_M M)\rho^M] R_t + [\rho ER_{t+1} + \rho^2 ER_{t+2} + \ldots + \rho^M ER_{t+M}]/[(1 + r_M M)\rho^M]$

or, $P_t = \psi R_t + \sigma_t$ ...(G)

where, $\psi = [1/ \{(1 + r_M M) \rho^M \}$, and,

$$\sigma_t = [\rho ER_{t+1} + \rho^2 ER_{t+2} + \ldots\ldots + \rho^M ER_{t+M}] / [(1 + r_M M)\rho^M]$$

Diagrammatically, the demand curve for individuals buying a house as investment is given as follows (Figure 3). It is called the SS curve given by equation G.

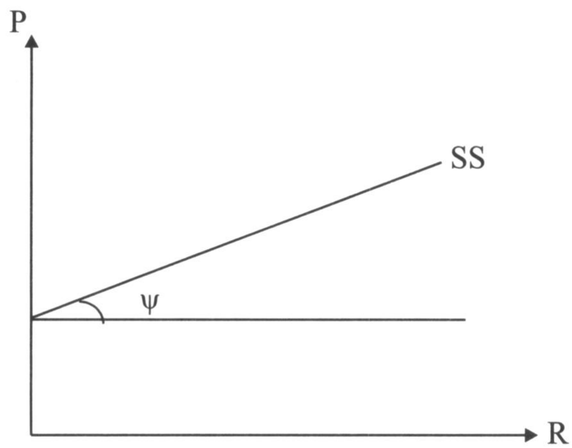

Figure 3: Buying for Investment Curve

The intercept of the curve is σ_t. SS is a positively sloped line with slope constant ψ such that $\psi = \psi(r_M)$, $\psi' < 0$.This implies that when r_M rises, SS becomes flatter. Alternative investment becomes more lucrative and demand for houses and hence house price falls.

4. STABILITY ANALYSIS: A MUCH SOUGHT AFTER FUNDAMENTAL AND THE ROLE OF THE POLICYMAKER

In order to analyze the stability conditions in the housing market it is required to study whether the house prices movement is fundamentally determined or is it the bubble that causes appreciation of prices. The attempt is to explain all possible situations with their corresponding paths in which the market is likely to move in absence of a regulator or planner and the correction required accordingly.

Following our model preceding this we move into stability analysis of the housing market.

From already established results, the two equations are:

The RR curve: $P_t = \lambda R_t + \beta_t$

where $\lambda = [N(1- \rho) / \rho(1+rN)(1- \rho^N)]$

and $\beta_t = \rho P^f_{t+1}$

The SS curve: $P_t = \psi R_t + \sigma_t$

where, $\psi = [1/ (1 + r_M M) \rho^M]$

and $\sigma_t = [\rho ER_{t+1} + \rho^2 ER_{t+2} + ... + \rho^M ER_{t+M}] / [(1 + r_M M)\rho^M]$

For stability analysis, we use phase diagrams (Figure 4, Figure 5, Figure 6 and Figure 7).

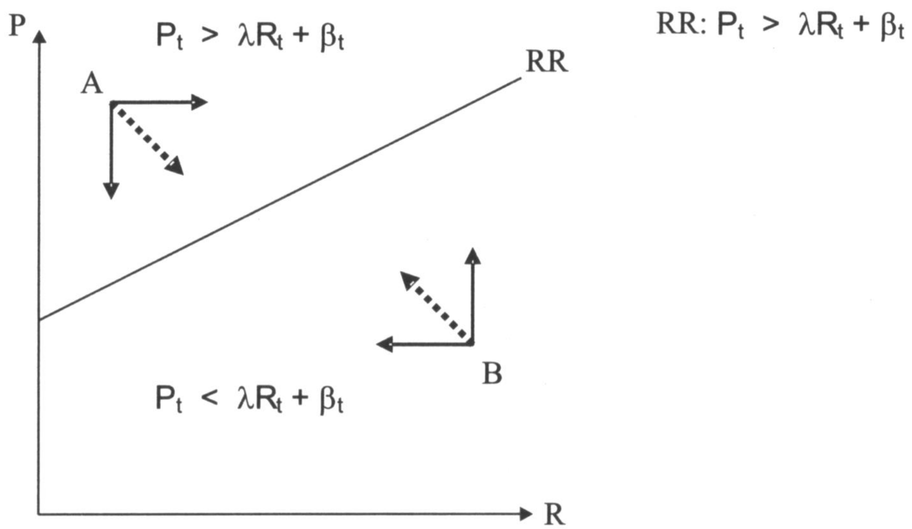

Figure 4: Buy-to-reside: RR curve

RR curve represents the equilibrium for the individuals buying a house to reside (first time buyers). Points off the curve are associated with disequilibrium conditions. We look into the dynamics off the RR curve. At a point above the curve- point A, for a given rental rate (R), price (P) is greater than that required to be in equilibrium. In other words, $P_t > \lambda R_t + \beta_t$, buying a house is costlier and hence individuals go for renting a house. As a result rental rises and house price falls. The direction of the arrows represents the movement of P and R in that region while the dashed line represents the resultant direction in the concerned region. At a point below the curve- point B, for a given rental rate (R), price (P) is lesser than that required to be in equilibrium. Thus, $P_t < \lambda R_t + \beta_t$ and buying a house is cheaper and hence individuals go for purchasing a house in the current period. As a result rental rate falls and house price rises until the market returns to the RR curve. Thus, from any point above or below the equilibrium line, the housing market moves towards it. Thus the RR curve represents stable equilibrium.

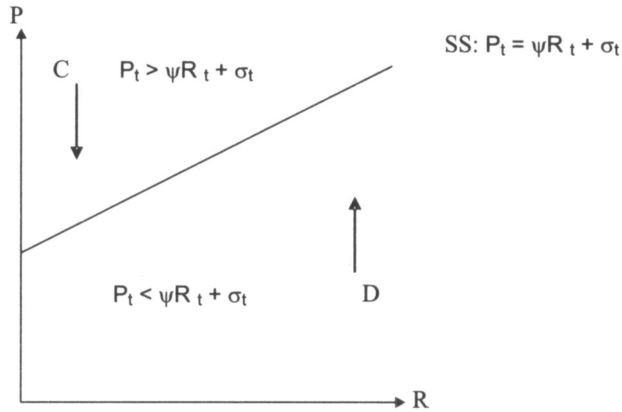

Figure 5: Buy–to-invest: SS curve

SS curve represents the equilibrium for the individuals buying a house as an investment option (experienced buyers). Points off the curve denote movement of P and R until the market converges to the SS curve. At a point C above the SS curve, price is greater than that required to be in equilibrium (equilibrium price). The price of house is too high to offset the gains from re-selling. So, it is more lucrative to invest in an alternative venture. This causes demand for houses to fall and its price gradually starts falling until the market returns to the SS curve. At a point below the line, point D, returns from housing market offsets the return from alternative investment. Thus, investors' demand for houses rise pushing the price up, until the gains from the two investment ventures equalize. The direction of the arrows represents the movement of P in that region. No matter from where the economy (housing market) begins, it gradually moves towards the SS curve.

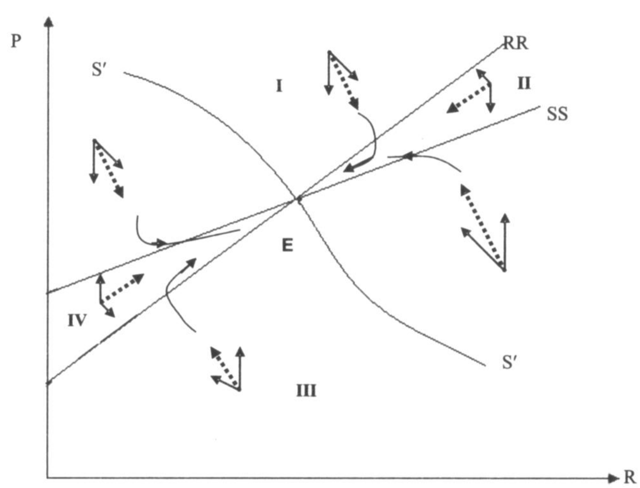

Figure 6: RR-SS dynamics (Combining the two sides) -
Case-I: RR curve is steeper than the SS curve

The two lines-SS and RR divide the phase diagram into four parts. We name the zones I, II, III, IV in clock-wise direction. Points in all the zones are off both SS and RR curves. In each region the thick dashed arrow represents the direction of the resultant force. The locus of points forming the trajectory S′S′ represents the saddle path. Once on the saddle path, the market converges to the long run equilibrium point.

Zones II and IV are stable: all trajectories drawn through these regions converge to E. Points in zones I and III also converge to the equilibrium. If the market begins from a point off the saddle path, in zone I or III, it will follow a trajectory to enter zone II or IV and then gradually reach the long run equilibrium point E. Thus, in case-I, no matter where the market begins it ultimately reaches equilibrium. Therefore for this type of a market a regulator does not really have a great role to play. But real estate markets are not so famous for their stable nature rather they are known to be volatile, at least in recent times.

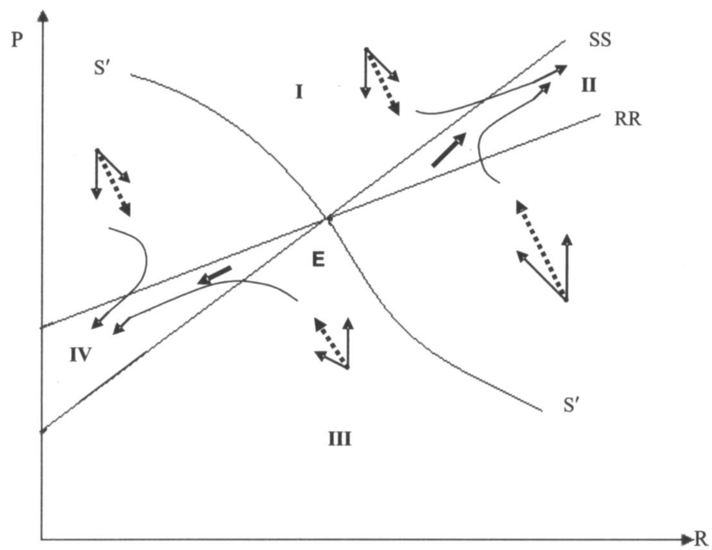

Figure 7: RR-SS dynamics (Combining the two sides) -
Case-II: RR curve is flatter than the SS curve

Here we can see, in region II and IV, all points diverge away from the long run equilibrium, E. Even in zones I and III, if the market begins from a points off the saddle path S′S′, it will enter zone II or IV and move away from E. Thus, if the regulator can place the market on the saddle path at the beginning then only it reaches a equilibrium state otherwise it can go in any direction. That is why real estate markets generally exhibit volatility.

The next question that arises is - What happens when equilibrium is reached?

In other words, we examine what happens when the regulator prescribes a price-rent combination that actually places the market on the saddle path and it eventually reaches an equilibrium situation with price (P*) and rent (R*). Let equilibrium be reached at the 0^{th} period. Then,

$$P^f_1 = P^f_2 = \ldots\ldots\ldots\ldots = P^f_M = P^* \quad \text{and}$$

$$R^f_1 = R^f_2 = \ldots\ldots\ldots\ldots = R^f_M = R^*$$

The SS curve (Buy-to-sell group) equation is $P_t = \psi R_t + \sigma_t$

where, $\psi = [1/ \{(1 + r_M M)\ \rho^M\}$

$$\sigma_t = [\rho\, ER_{t+1} + \rho^2\, ER_{t+2} + \ldots\ldots\ldots + \rho^M\, ER_{t+M}] \;/\; [(1 + r_M M)\rho^M]$$

Now, since the future prices and rents are same, expected revenues earned from the future periods must also be the same. Expected revenue in any period is also time invariant.

Now, p_{iB} = probability $[\ P^* \leq \lambda R^* + \beta_i\ ]$; [since, $P^f_i = P^*$ and $R^f_i = R^*$]

$= p_B$; [since it depends only on r i.e. independent of i]

Similarly, $p_{iR} = p_R$

The RR curve (Buy-to-reside group) equation is

$$P_t = \lambda R_t + \beta_t$$

where $\lambda = [\ N(1-\rho) \;/\; \rho(1+rN)(1-\rho^N)\ ]$ and $\beta_t = \rho P^f_{t+1}$

Therefore, with equilibrium being reached, $\beta_t = \rho P^* = \beta^*$

Thus, RR becomes: $P^* = \lambda R^* + \beta^*$ ...(J)

Thus, once equilibrium is achieved, the RR and SS curves become time-invariant and the equilibrium price and rent remain to be the equilibrium price and rent for all future periods. Therefore, the regulator supplies the same price-rent combination and the market remains stable unless some external shock changes the parameters. Now since equilibrium is attained there is no change in price in each period. So the investor rents out the house in the period of his purchase (since he cannot sell it in that period itself, by assumption) and is able to sell it in the next period, since the market is on the RR curve and the condition, $[\ P^* \leq \lambda R^* + \beta^*\ ]$, holds with equality.

Thus, Revenue with certainty = $R^* + \rho P^*$.

If a house is bought for resell, the investment period is one year. Thus, at equilibrium, it should earn same as investing the same money (P*) in a t-bill for one year. Revenue from alternative investment with one year maturity = $P^*(1 + r_1)\rho$. At equilibrium,

$$R^* + \rho P^* = P^*(1 + r_1)\rho$$

or, $$R^* = (1- \rho) P^* \qquad ...(K)$$

Substituting above in (J):

$$[\rho(1+rN)(1- \rho^N)] / [N(1- \rho)] = 1 \qquad ...(L)$$

We have combined equilibrium conditions of both the first-time and experienced buyers. It would be interesting to examine what happens under equilibrium,

(a) if the experienced buyers buy houses to reside or,

(b) if the first-timers borrow money to invest.

(a) In this model, experienced buyers are rich investors who need not borrow money to buy houses. Now, under equilibrium, buying today and buying tomorrow are equivalent. So, the decision to take is whether to buy at all or to stay at rent forever. If buy today, cost is P^*.If stay at rent forever, then the cost is,

$$R^* + \rho R^* + \rho^2 R^{*2} + \ldots\ldots\ldots\ldots = R^* / (1 - \rho)$$

They are indifferent between the two options if, $P^* = R^* / (1 - \rho)$ which is same as (K).

(b) First-time buyers are those who do not have any savings. Thus, if they want to invest, they must be borrowing to invest. Under equilibrium, investing in either option (houses and t-bills) earns the same. If he borrows 1 unit of money with repayment period N, then $(DPV_L) = [\rho(1+rN)(1- \rho^N)] / [N(1- \rho)]$. Now if he invests that borrowed one unit of money for one period in t-bills (which is equivalent of investing in houses under equilibrium) he earns $(1 + r_1)$ at the end of the first period. So, $(DPV) = (1 + r_1)\rho = 1$. At equilibrium, there should not be any arbitrage opportunity. So, DPV of borrowing should be equal to DPV of earning from investing the borrowed amount. Therefore, at equilibrium, $[\rho(1+rN)(1- \rho^N)] / [N(1- \rho)] = 1$, which is nothing but (L). Thus, at equilibrium, both the groups are indifferent between buying a house to reside and renting as well as buying a house to resell and investing the same amount in a risk-free asset like t-bill.

Simplifying (L), we get,

$$r = [\{N(1- \rho)\} / \{\rho (1- \rho^N)\} - 1] / N$$

$$= (1- \rho) / \{\rho (1- \rho^N)\} - 1/N$$

As N tends to infinity, $$r = (1- \rho) / \rho$$

or, $$r = r_1$$

Thus, in the long run, per period interest rate on bank loans and per period interest rate offered on risk-free assets are same at equilibrium. In the current real estate scenario, a short run equilibrium seldom exists. It can be said that the economy is on the right track but it cannot be stationary unless the long run equilibrium is achieved. At a short run, the market can be thought of being at equilibrium if it is on a path that leads to the long run equilibrium.

5. CONCLUSION

This paper is an attempt to investigate the possible economic reasons behind housing market instability. Also, to understand the role of a regulatory authority in arresting instability which may turn out to be a threat to the economy as a whole, if not nipped in the bud. To do this, we addressed the basic equilibrium conditions in context of housing markets. We considered two sets of buyers, buy-to-reside group or the first-time buyers who take loans to buy houses and buy-to-resell group or the experienced buyers who invest in housing sector with profit-making motives. We examined equilibrium conditions for these two groups separately and then combined them to arrive at the market equilibrium condition.

Looking for stability in the system, we see that there are possibilities of a housing market being stable in the sense that it attains stability by itself. We find that there are cases where a regulator plays a very important role to bring the market on the stable path. To identify the stable path, we analyzed all off-the-equilibrium dynamics of the relevant variables and hence the stability conditions.

In case-I, we show that the market would ultimately converge to the equilibrium whatever be the starting point. So, there can be a case where economy can reach equilibrium without a planner. A regulator's role becomes important when a market does not follow a self-corrective model to reach equilibrium, as in case II where there is only one path that leads to the equilibrium and all other paths lead the market more away from the equilibrium. This is where we need a planner to place the economy right back on the saddle path. Now once the market is on the right track then it needs no further intervention.

So for markets where case-I prevails, it attains equilibrium by itself and in case-II we need a planner to place it on the right track and then again the market on its own moves towards the equilibrium.

In recent times (post global recession), it is well acknowledged that regulation is necessary in the real estate market. Our attempt has been to simultaneously show and distinguish between markets/economies where we need regulation/government intervention and markets/economies where we can rely upon the market forces.

Finally, we cross-checked the equilibrium conditions to show that at equilibrium neither group has any incentive to move away. Thus, if the regulator can once successfully place the market on the stable path, it by its own reaches equilibrium and does not move further until some exogenous shock disturbs the system.

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