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Diagnostic Analysis of Imports Demand Behavior in Saudi Arabia

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Abstract

This research undertakes a short-run analysis of the dynamics of real imports behavior in Saudi Arabia over the period 1988-2015, using the standard OLS approach. The empirical findings reveal that real imports are mainly driven positively by the forces of real national income (GDP) and real aggregate investment. The periods in which there are geopolitical tensions (the Gulf War, and the recent war with the rebels in Yemen) involving Saudi Arabia are empirically found to lower the volume of imports compared to other periods of no significant geopolitical tensions. Surprisingly, the real effective exchange rate (REER) negatively affects real imports, implying the extremely limited substitutability between domestic and international capital goods. The effect of government spending on imports is rather weak and insignificant in most cases, undermining policy prescriptions to cut public spending significantly to minimize pressure on the Saudi external balance. Lastly, the price of imports, private consumption, and bank credit are insignificant factors for import demand. Based on these findings, relevant policy implications are drawn and provided at the end.

Keywords: Imports demand, national income, public sector, investment, Saudi Arabia

JEL Classification: E22, F14, O25

I. Introduction

As one of the largest and most open economies in the Middle East and North Africa region (MENA), Saudi Arabia has been facing great challenges in recent years. The dependence on foreign trade and the global uncertainties in the oil market are now becoming heated issues of debate for policymakers and researchers in Saudi Arabia. The sharp and sustained decline in crude oil prices, deterioration in foreign reserves, regional uncertainties, and worsening of fiscal and external balances are weighing heavily on the Saudi economy in the last few years.These challenges have prompted the Saudi authorities to embark on a bundle of ambitious reforms outlined in the recently announced 'Vision 2030' initiative and the National Transformation Program'. Although those reforms intend to address several issuessuch as containing the fiscal deficit, reducing the deterioration of the Saudi current account balance, developing non-oil export markets, and vitalizing the private sector, much remains to be done to develop and support certain local industries to substitute for imports from other countries.

The import market has widened significantly in the last two decades in Saudi Arabia. As a percentage of realGDP, real imports have nearly doubled between 2003 and 2015, implying that import growth has outperformed GDP growth significantly. In absolute terms, real imports have nearly tripled during the same period. This drastic development should receive sufficient attention because of its implications on the external balance, the likelihood of imported inflation, as well as the effect on local production industries and employment creation. These facts underscore the importance of this research. Further significance of this work comes from the fact that import demand behavior has received little attention in academic research. To my knowledge, only a few studies have researched import demand in Saudi Arabia and some of them are now outdated already.

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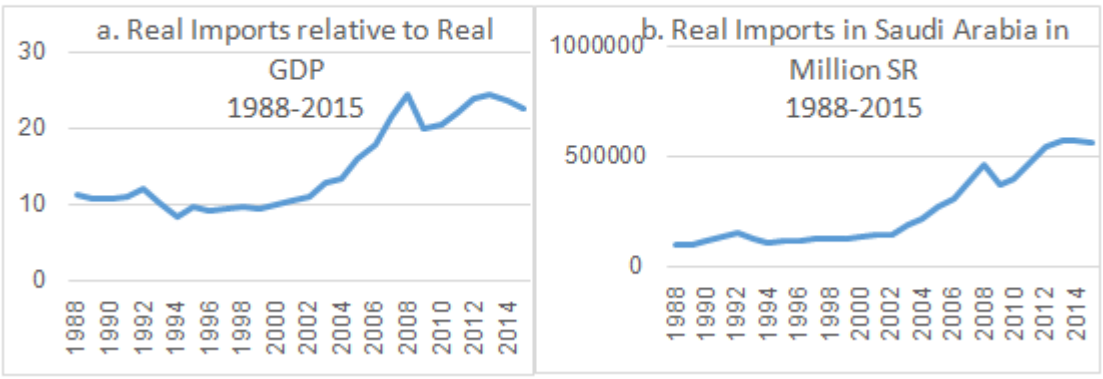
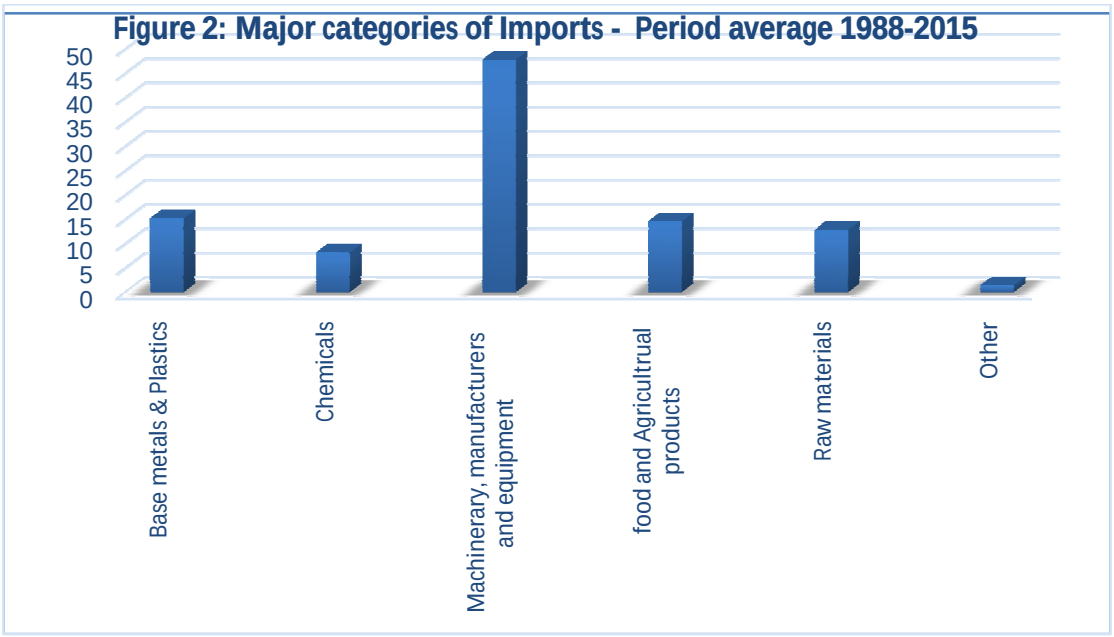
This research undertakes a short-run diagnostic analysis of the behavior of Saudi aggregate imports in a holistic way that takes into account likely relevant economic and non-economic factors over the period 1988-2015.As such, this work offers new insights to understanding import demand behavior and proposes appropriate policy implications based on the empirical findings and the widely recognized macroeconomic theories in this area.The rest of this paper is structured in the following way: Section II outlines the stylized facts of real imports in Saudi Arabia; section III reviews the related literature of analyzing dynamics of import demand; section IVdiscusses the data properties and provides the research methodology; in section V, the results are presented and interpreted; and the conclusion and policy implications are provided in the last section.

II. Stylized facts about Imports in Saudi Arabia

Aggregate imports in Saudi Arabia have followed a somewhat stable path from 1998 to 2003hovering around 10 percent of GDP (Figure 1.a). However, the volume of imports has increased threefold, approximately, between 2004 and 2015 (Figure 1.b). Overall, the greatest component of imports, as shown in Figure 2, is 'Machinery, Manufactures, and Equipment'averaging 48% of total imports during the analysis period (1998-2015).

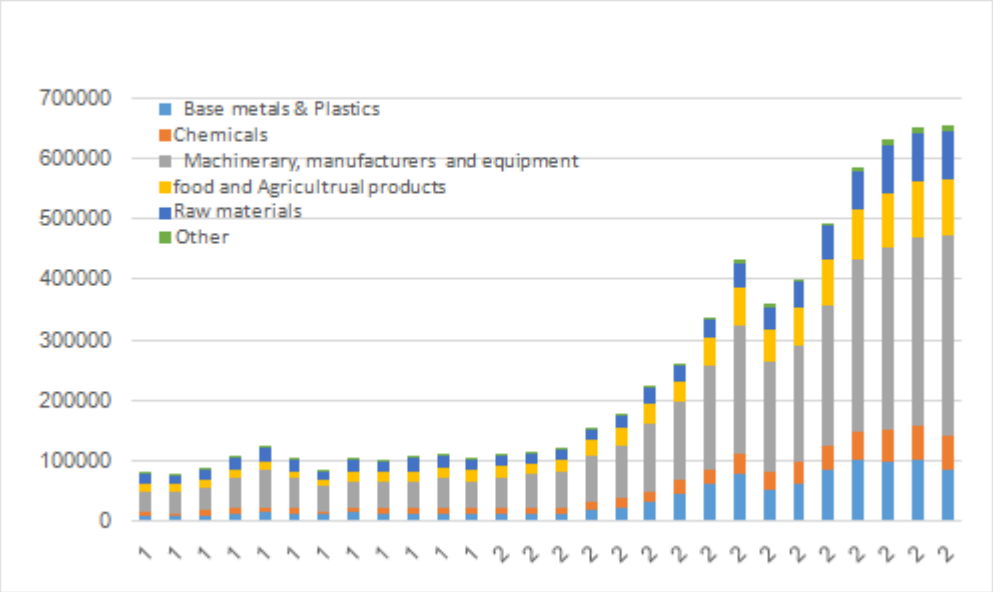
Figure 1





The next largest components of imports have been 'Food' and 'Base Metals & Plastics', each making up about 15 percent of the total. However, most of the growth in imports over the same period has come from 'Machinery, Manufactures, and Equipment' (Figure 3). Starting from 2004, this category has increased consistently, thereby driving overall imports to unprecedented levels.

Figure 3: Components of Imports in Saudi Arabia 1988-2015



The dynamics of imports categories in Figure 3 indicate that capital-intensive industries (Machinery, Manufactures, and Equipment; Base Metals & Plastics)are the dominant and most growing component. The labor-intensive industries such as Food and Agricultural Products have grown modestly during the analysis period, but have been relatively stable in the last few years.Most of the imports in Saudi Arabia, on average, come from non-MENA countries, namely European Union countries (16 percent), North American countries (18 percent), and the East Asia countries (45 percent). On the other hand, more than 50 percent of the Saudi Imports from MENA countries have come from four countries; UAE, Egypt, Bahrain, and Oman (IMF, 2016).

III. Literature review

A few studies have analyzed the behavior of import demand in Saudi Arabia. Doroodian et al (1994) has estimated the import demand function for Saudi Arabia for the period 1963-1991. Their empirical results show that the relative price formulation of the traditional import demand function is inappropriate for estimating elasticities of import demand. In addition, the duration of import adjustment, according to their study, to changes in the explanatory variables is approximately two years, which seems longer than those obtained by other studies for other countries. Lastly, the income elasticity of demand in the long run was found inelastic, but the price elasticity of demand for imports was found to be large. Aldakhil and Al-Yousef (2002) have used co integration Analysis and Granger's and Hendry's Error Correction models to identify the key determinants of Saudi imports during 1968-1998. Their results indicate that domestic prices, import prices, and income are important factors determining import demand. However, aggregate imports are found to be elastic with respect to domestic prices, but inelastic with respect to import prices.

Aljebrin and Ibrahim (2012) used panel data in a Seemingly Unrelated Regression (SUR) model to estimate the parameters of import demand determinants in the Gulf Cooperation Council countries (GCC). The analysis extended over the period 1994-2008, and the authors found that real income, private consumption, international reserves, and gross capital formation have positive effects once imports, both in the short and long runs.

On the other hand, their results show a negative relationship between imports and the relative price of imports as well as government consumption expenditures in the long run. Amiri and Talbi (2012) have examined the empirical determinants of import demand in oil exporting countries, using panel co integration analysis. Import demand in these countries according to this research depends positively on domestic demand, exports, the real exchange rate and oil prices, while the current account balance tends to reduce demand for imports. Haghnevis, Kiani, and Rad (2014) have estimated import demand function for the members of the Organization of Petroleum Exporting Countries (OPEC), using co integration panel data analysis. The authors argue that 60 percent of imports in those countries depend on their oil revenues. Ibrahim, Mohamed Abbas (2015) have estimated the critical parameters of the factors driving merchandise import in Saudi Arabia using OLS and Error Correction Modelling over the period 1975-2011.The outcomes of this work indicate there is positive and significant relationships in the long-run and short-run between imports and real gross GDP, gross capital formation, private consumption, government consumption, international reserves, and the relative price of imports to domestic prices.

Several other studies on other regions have estimated import demand functions with various methodologies. Rehman (2007) uses the conintegreation technique to analyze import demand for Pakistan during 1975-2005. In this study, the estimated elasticities indicate that changes in real income and import prices significantly affect Pakistan's import demand in the long run. However, the variations of domestic and import prices do not affect import demand significantly in the short-run. According to the author, the low-income elasticity of import demand suggest that most of the imported goods in Pakistan are necessary goods. For South Korea, Chang, Ho, and Juang (2005) used unrestricted error correction model - the bounds test analysis- to re-analyze the long-term relationships between the demand for imports and it's determinants for South Korea over the period 1980-2000.The results show that the volume of imports, income, and relative prices are all co integrated, with elastic import demand with respect to income and inelastic coefficient of relative prices in the long run. Vusi (2000) estimated the demand function for South Africa and found that the demand for imports is generally more responsive to changes in income than to changes in relative prices. In addition, the empirical results of this paper suggest that the exchange rate policy does not have any major influence in curbing unnecessary imports. The author argues that the government should embark on a policy that discourages importation of products that are available in the South African market. Accordingly, the author argues, economic policy should then aim at strengthening domestic industries and expanding the domestic market.

IV. Data and Methodology

This research uses annual time series data over the period 1988-2015 from the Saudi Arabian Monetary Agency (SAMA), the International Financial Statistics (IFS) of the International Monetary Fund (IMF), as well as the World Economic Outlook (WEO) database by the IMF. The definition of the variables and the source of each data series are provided in Table A1 in the Appendix. To ensure stability of the data, each variable was transformed into natural logarithms then a first difference is applied to all the data series. The variables were then tested for stationary using Augmented Dicky-Fuller Unit Root Test(ADF), and the results are shown in Table (A2) in the Appendix. The data series were found stationary with log-first differencing except real government spending and the real effective exchange rate. When taking a second difference, the unit roots in both series were eliminated and they became stationary at the 1 percent level of significance.

The time series data were then tested for correlation to avoid the multicollinearity problem. The results show that the variables are not much correlated with each other, and this ensures proper initial selection of the variables. The correlation matrix is provided in Table (A3) in the Appendix.

Using OLS regressions, this research relates import demand to a set of independent variables as follows:

$$\Delta RMt = \alpha + \beta \Delta xt + \delta z + \varepsilon t \quad (1)$$

Where ΔRM is the log first-difference of real imports in Saudi Arabia, Δxt is a vector of independent time-varying variables in their appropriate log-difference form, $z$is a set of binary variables to control for exogenous shocks, and ε is the error term. More specifically, the following specification includes the likely driving factors of Saudi imports according to economic theory and the review of the related literature:

$$\Delta RMt = \alpha + \beta \Delta Yt + \mu \Delta Gt + \gamma \Delta It + \theta \Delta PCt + \rho \Delta CRTt + \sigma \Delta TOTt + \vartheta \Delta REERt + \delta z + \varepsilon t \quad (2)$$

Where ΔRMt is real imports, ΔYt is real gross domestic product, ΔGt is real government spending, ΔIt is real gross capital formation, ΔPCt is real private consumption, and $\Delta CRTt$ is real credit to the public and private sectors.

The original nominal data series were transformed into real series using the Saudi consumer price index (CPI) with the base year 2010. The variable $\Delta TOTt$ is the relative price (index) of imports to domestic prices (CPI), and ΔREER is the real effective exchange rate index, with both using 2010=100.The relative price of imports index*(TOT)*has been developed using the WEO databases a weighted average of five international price indices with equal weights.

These indices are 'Commodity Industrial Inputs Price Index', 'Commodity Non-Fuel Price Index', 'Commodity Cereals Price Index', 'Commodity Food Price Index', and 'Commodity Food and Beverage Price Index'. The choice of these indices is based on the composition of Saudi imports outlined in section II earlier. However, this research uses the derived import price index (DLPM) directly as an alternative to the *TOT* variable. The exogenous shocks are included in the set *(z)* as follows: the dummy variable (*Crisis*) controls for the years of crises (2005-2006 stock market crash in Saudi Arabia , 2009-2011 the global financial crisis impact on Saudi Arabia, and 2013-2015 the global recession and its effect on export revenues in the Saudi Economy); the dummy variable (WAR) controls for years of war which Saudi Arabia was part of including the Gulf War 1991-1992, and the war with the rebels in Yemen in 2015; and lastly the dummy variable (WTO) controls for the joining of Saudi Arabia to the World Trade Organization (WTO) since 2005 and the liberalization of trade in goods and services. These dummy variables take the value of (one) for the concerned years and zero otherwise.

V. Analysis of Results

Several sub-model specifications (1-7) were the used to include the effects of the relevant different factors in the OLS regressions (Table 1). Regressions 1-7are then compared in terms of the goodness of fit, joint significance of the variables, serial correlation, as well as the level of significance of the coefficients. As such, model specification (3) is selected to be the benchmark regression as it outperformed the other models offering better properties.

Table 1: OLS Estimates; Dependent Variable: Real Imports

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Intercept	-0.047 (0.185)	-0.027 (0.388)	-0.033 (0.221)	-0.042 (0.297)	-0.019 (0.580)	-0.041 (0.226)	-0.043 (0.226)
DLRGDP	0.956 (0.003)**	1.109 (0.001)***	1.268 (0.000)***	1.126 (0.000)***	1.116 (0.001)**	1.237 (0.000)***	0.985 (0.005)**
DDLREER	-0.409 (0.203)	-0.505 (0.134)	-0.634 (0.057)*	-0.541 (0.122)	-0.483 (0.176)	-0.643 (0.079)*	
DLRCRDT	0.147 (0.452)	0.079 (0.712)		0.161 (0.416)			0.181 (0.342)
DLPCONS	0.464 (0.377)					0.325 (0.599)	
DTOT (PM/CPI)	0.021 (0.927)	0.144 (0.401)		0.038 (0.855)	0.152 (0.390)		
DDLGOV	0.134 (0.226)			0.128 (0.233)			0.222 (0.041)**
DLRGFCF	0.471 (0.083)*	0.471 (0.075)*	0.670 (0.000)***	0.642 (0.044)**	0.508 (0.011)**	0.620 (0.012)**	0.549 (0.014)**
DLPM						-0.059 (0.853)	
War			-0.128 (0.011)**	-0.106 (0.083)*		-0.118 (0.093)*	
Crisis				-0.058 (0.234)	-0.014 (0.687)		
WTO				0.039 (0.473)			0.012 (0.747)
Adj R^2	0.61	0.60	0.68	.063	0.60	0.64	0.60
Wald F-Stat	5.88	9.82	11.4	5.25	9.78	8.88	6.30
DW	1.84	1.85	1.99	1.82	1.80	1.98	1.73
Obs.	24	24	24	24	24	24	24

Note. The symbols ***, **, * denote the significance at the levels 1, 5, and 10 percent, respectively. P-values appear in parentheses with White heteroscedasticity consistent standard errors.

Relevant checks reinforce the validity of model specification and the reliability of estimates, especially for the benchmark regression. The Durbin Watson Statistics provided against each regression rule out the possibility of serial correlation of the residuals. This is confirmed by the information in the correlogram of the residuals of the benchmark regression in Table A4 in the Appendix, where autocorrelations and partial autocorrelations at all lags is nearly zero, and all *Q*-statistics are insignificant with large *p*-values. Wald F- statistics assure the joint significance of the variables included in each model, while white heteroscedasticity consistent standard errors are used to ensure against the heteroscedasticity problem that distorts statistical inference from the regression estimates. In addition, normality of the residuals for the benchmark regression (3) is assured and shown in Figures A1 and A2 in the Appendix. As provided in Table (1), real imports in Saudi Arabia are mainly driven by the dynamics of real GDP and real gross fixed capital formation (RGFCF). These two variables consistently maintain their statistical significance across the several model specifications. However, it is clear that real income (GDP) is a much more important factor driving imports' behavior in Saudi Arabia. The results also indicate that demand for imports is income elastic as the elasticity coefficient is greater than one in the benchmark regression and most other specifications.

In the benchmark regression (3), a one percent increase in real GDP translates into 1.26 percent increase in real imports in Saudi Arabia. The effect of aggregate investment on import demand in Saudi Arabia ranges between 0.47 to 0.67, and has remained statistically significant in all the different regressions. In the benchmark regression, a one percent increase in aggregate investment leads to a 0.67 percent increase in import demand. This connection between investment demand and import behavior is particularly relevant, especially since the dominant import category in Saudi Arabia is 'Machinery, Manufactures, and Equipment'. An increase in RGFCF implies an accumulation of fixed capital, and this is reflected in the continuous growth of importing machines, manufacturers, and equipment over the analysis period. Some factors in the various regressions have shown little relevance in relation to real import behavior. Real government spending has not shown to be an important driver of import demand. In most cases, government spending is statistically insignificant except in one model specification only (number 7). There, a one percent increases in government spending increases import demand by only 0.22 percent. This finding implies that the bulk of imports demand is not by the public sector, but rather by private Investors in the various sectors of the Saudi economy, and this is supported by the result of the aggregate investment. On the other hand, real private consumption, the relative price imports, real credit in the economy, as well as the weighted average price of imports are all found to be insignificant factors to import demand behavior in Saudi Arabia.

The result on the real effective exchange rate (REER) is rather surprising. As an indicator or competitiveness, the real effective exchange rate (REER) is found to have a negative effect on import demand. Since an increase in the REER indicate a worsening of competitiveness (higher cost of domestic goods in the international market), it should, theoretically, translate into an increase in import demand. However, the outcomes of the benchmark regression suggest that a one percent increase in the REER leads to 0.63 decline in real imports. One explanation of this finding could be the limited substitutability between domestic goods and imported goods, especially since most imported goods are machines, manufacturers, and equipment. These kind of capital goods may be under produced locally or extremely limited because of the limited technological capacity for domestic firms.

The effect of wars on Saudi imports, is not surprisingly, negative. As evident in the benchmark regression, real imports are lower by 0.128 percent during times of war than otherwise. During 1991-92, Saudi Arabia was engaged in the Gulf War after the Iraqi invasion of Kuwait, while in 2015 the war started between Saudi Arabia and the rebels in Yemen. These geopolitical issues obviously weigh negatively on the behavior of imports and reduce the economy's capacity to import goods and services. The years of crises (2005, 2006, 2009-11, 2013-15) as well as the joining of Saudi Arabia to the WTO since 2005, although exhibiting the right signs, are not shown to be significant factors affecting the behavior of import demand. This result is consistent throughout the various model specifications.

VI. Conclusion and policy implications

Real import demand growth has outstripped real income growth significantly in Saudi Arabia in recent years, mainly driven by capital-intensive goods. This high and sustained level of import represents a leakage from the economy to the rest of the world and reduces short-term economic capacity for employment creation, growth, and industrial transformation.

With the rising concerns about the deteriorating external balance and the need to vitalize local industries to substitute for imports in Saudi Arabia, particular attention need to be given to import demand behavior and the industries that make up the bulk of importation.

This paper offers new insights on the dynamics of import demand in Saudi Arabia. The high-income elasticity of demand for imports suggests that these capital-intensive goods are not 'necessary goods' in the economic theory sense of the world. As such, the investment demand for such imported goods can be rather localized by making intensive efforts to vitalize manufacturing, machinery production, equipment production, and base metals and plastics production. The investment elasticity of imports suggests that if a good portion of this investment demand were directed toward the local economy, it would lead to a higher multiplier effect, generate more employment, and stimulate economic growth. The resulting higher growth would attract further investors to the domestic economy and this accelerates growth further. This is exactly the spirit of the 'Accelerator Theory of Investment', which policymakers need to carefully evaluate and execute to enact 'leapfrogging' of industrialization in the local economy, when the radical innovations eventually become the new technological paradigm. Such import-reducing efforts would minimize the pressure on the external balance in Saudi Arabia, and this in turn would help promote internal macroeconomic stability. Another important implication of this work is the result on government spending and its relation to import demand. Surprisingly, the effect of public sector spending on imports is rather marginal, suggesting the limited contribution of government expenditures to current account deficits. This contradicts claims by some researchers and consultants that the growth of the public sector is deteriorating the Saudi current account significantly. This empirical evidence refutes the recommendations to substantially cut government spending in order to minimize pressures on the Saudi external balance vis-a-vis the rest of the world.

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Appendix

Table (A1): Sources of Data

Variable	Definition	Data Source
DLPM	Real Imports	Derived from SAMA database
CPI	Consumer Price Index (CPI)	SAMA database
DLRFCF	Real Gross Fixed Capital Formation	Derived from SAMA database
DLRGDP	Real GDP	SAMA database
DDLEER	Real Effective Exchange Rate (REER)	International Financial Statistics (IFS)
DLRCRDT	Real Credit	Derived from SAMA database
DLTOT	Terms of Trade (PM/CPI)	Derived from WEO & SAMA database
DDLGOV	Real Government Spending	Derived from SAMA database
DLPCONS	Real Private Consumption	Derived from SAMA database
DLPM	Import Price Index (weighted average)	Derived from World Economic Outlook
Crisis	Crisis Dummy Variable	Author's Discretion
WTO	WTO Dummy Variable	Author's Discretion
WAR	War Dummy Variable	Author's Discretion

Table (A2): Unit Root Tests

LOG Variable	First difference	Second difference
Real Imports	0.0029***	----
Real Gross fixed capital formation	0.0125**	----
Real GDP	0.0032***	----
Real effective exchange rate (REER)	0.2453	0.000***
Real Credit	0.0109**	----
Import Price Index (weighted average)	0.0151**	----
TOT (PM/CPI)	0.010**	----
Real Government Spending	0.3225	0.000***
Real Private Consumption	0.052*	----

Note. ***, **, * denote the significance at the levels 1, 5, and 10 percent, respectively.

Table (A3): Variable Correlation Matrix

	DLRM	DLRGFCF	DLRGDP	DLRCRDT	DDLREER	DDLGOV	DLTOT	DLPCON	DLPM
DLRM	1.000000	0.643888	0.629082	0.414265	-0.177228	0.081627	0.435067	0.603604	0.442604
DLRGFCF	0.643888	1.000000	0.333548	0.573661	0.211330	-0.402395	0.306206	0.596637	0.349012
DLRGDP	0.629082	0.333548	1.000000	0.233704	-0.060878	0.107399	0.185701	0.299031	0.198629
DLRCRDT	0.414265	0.573661	0.233704	1.000000	0.174663	-0.426636	0.132171	0.325352	0.116711
DDLREER	-0.177228	0.211330	-0.060878	0.174663	1.000000	-0.444435	-0.372871	-0.034177	-0.303102
DDLGOV	0.081627	-0.402395	0.107399	-0.426636	-0.444435	1.000000	0.232704	0.031197	0.181658
DLTOT	0.435067	0.306206	0.185701	0.132171	-0.372871	0.232704	1.000000	0.504911	0.980089
DLPCON	0.603604	0.596637	0.299031	0.325352	-0.034177	0.031197	0.504911	1.000000	0.562284
DLPM	0.442604	0.349012	0.198629	0.116711	-0.303102	0.181658	0.980089	0.562284	1.000000

Table A4: Correlogram Residuals Squaredfor the Benchmark Regression

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.065	0.065	0.1136	0.736
		2	0.109	0.105	0.4516	0.798
		3	-0.296	-0.314	3.0571	0.383
		4	-0.236	-0.228	4.7987	0.309
		5	-0.165	-0.082	5.6945	0.337
		6	0.185	0.194	6.8806	0.332
		7	-0.069	-0.217	7.0530	0.423
		8	0.110	-0.069	7.5242	0.481
		9	0.059	0.183	7.6687	0.568
		10	-0.160	-0.225	8.8116	0.550
		11	-0.084	-0.162	9.1517	0.608
		12	-0.181	-0.145	10.861	0.541

Figure A1: Goodness of Fit for the Benchmark Regression

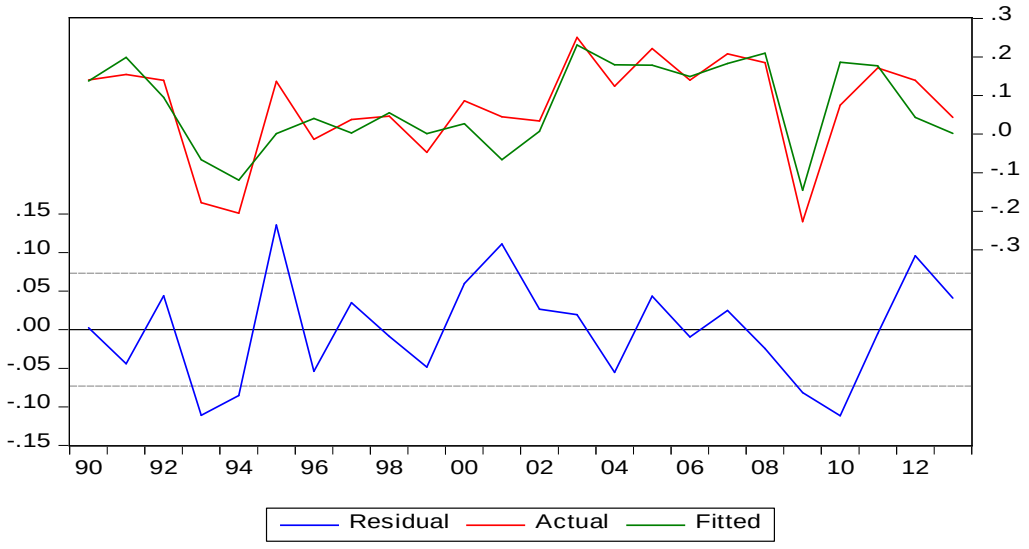

Figure A2: Normality of the Residuals for the Benchmark Regression