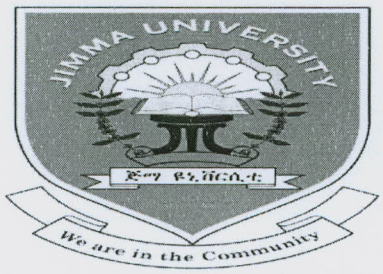

JIMMA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

AN EMPIRICAL ANALYSIS OF ETHIOPIA'S IMPORT DEMAND BEHAVIOR: JOHANSEN COINTEGRATION AND GRANGER CAUSALITY APPROACHES

BY

ABREHAM MENGISTU

MAY, 2013

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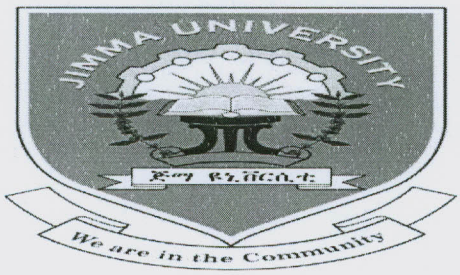

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LIST OF ACRONYMS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criteria
EEA	Ethiopian Economic Association
ERCA	Ethiopian Revenue and Customs Authority
ARMA	Autoregressive Moving Average
FOREX	Foreign Exchange
FPE	Final Prediction Error
GDP	Gross Domestic Product
HQ	Hannan-Quinn statistics
IRFs	Impulse Response Functions
IMF	International Monetary Fund
ISI	Import Substitution Industrialization
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
LDCs	Least Developed Countries
MAE	Mean Absolute Error
MAPE	Mean Absolute Percentage Error
MoFED	Ministry of Finance and Economic Development
NBE	National Bank of Ethiopia
OLS	Ordinary Least Squares
PP	Phillips Perron
REER	Real Effective Exchange Rate
RMSE	Root-Mean-Squared Error
SBC	Schwartz-Bayesian Criteria
SSA	Sub Saharan Africa
USD	United States Dollar
VAR	Vector Auto Regression
VDCs	Variance Decompositions
VECM	Vector Error Correction Model
WB	World Bank

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

The importance of foreign trade in the development process of economies, in general, and the issue of imports, in particular, has long been an area of debate to many scholars and researchers. Mercantilists were among the first class of economists to stand against imports. On the contrary are economists like Ricardo who favor trade on the basis of comparative advantages that countries trade with each other basically for the same reasons that individual people trade with each other. This view of the Ricardians, though not in its strict sense, makes much more sense in today's world of globalization, where no nation can utterly produce all the goods and services required for domestic consumption and investment.

At the nascent stages of economic development, as it is in most developing nations today, the level of capital accumulation and quality of labour force are generally low. Hence, domestic output is low that it is difficult to allocate domestic demand such as consumption and investment. Moreover, exports to other countries are limited to primary goods (mainly natural resources) and tend not to be a very large share of the overall economy. That is, exports of developing countries are subject to periodic fluctuations in the world market that the revenue from this source tends to oscillate accordingly. This was what party led to a persistent decline in the foreign exchange earnings of most African countries from the early 1980s and forced them to adopt economic reform programmes, which were expected to affect imports negatively, as part of the strategy to restore external balance. One of such policies was the Industrialization through import substitution (ISI) policy, which was the dominant strategy for economic development during the 1950s and 1960s.This policy decision, however, is definitely harmful to investment and output in developing countries since these countries heavily rely on imports for their domestic production; and foreign exchange availability plays a vital role in the growth process of developing nations (Moran, 1989; Dike et al, 2011).

Ethiopia, like many other developing Sub-Saharan African country, followed the import substitution industrialization (ISI) strategy between 1958 and 1992.This strategy aimed at

ABSTRACT

This study examines the long run and the short run determinants of import demand for Ethiopia using a time series data for the period 1970/71-2010/11. Both the simple descriptive analysis and the Johansen's cointegration approach are employed to see the *impact of real GDP, domestic price level, foreign exchange reserves and exchange rate on the import demand of the nation. This study differs from other similar studies in Ethiopia for it employs Johansen cointegration approach, stationary series, more variables and more recent observations. The quantitative results from cointegration and error correction specifications show that imports of the country are sensitive to changes in domestic output level and foreign exchange reserves both in the long run and in the short run though their estimated elasticity coefficients are smaller in the later case; and domestic price level and exchange rate are found to be statistically insignificant. While only foreign exchange reserves Granger cause import in the short run, all variables jointly Granger causes import in the long run. The estimated Vector Error Correction Model of import is stable over the sample period that it can be used for a policy purpose. The lower short run income elasticity of import shows the room available for import substitution industrialization strategy in Ethiopia and the higher long run income elasticity provides an evidence in favor of product diversification. Devaluation can also be made effective by supplementing it with import restriction schemes.*

Keywords: Import Demand, Johansen Approach, Granger Causality Approach, Model stability, Forecast Performance, Ethiopia

promoting local infant industries with the primary objective of saving substantial foreign exchange by encouraging the use of locally available raw materials, particularly agricultural and mineral products, for the domestic and export market (Tsegaye, 2011).

Primarily initiated by IMF and the World Bank, the period 1992/93 through 2010/11 is comprised of three Economic policy reform periods that the country's trade regime went through. The first phase started in 1992 when Birr was devalued against dollar and covered the period from 1992/93 to 1994/95.This period witnessed structural economic reform in which the government reduced import tax and introduced new tax systems. The second phase covered the period 1994/95 through 1996/97 and had an objective of nurturing the competitiveness of the industrial and agricultural sectors by following a more liberal external trade and foreign exchange policies than the first phase. In this phase, the maximum import duty on luxury items was 50 percent. The third and more liberal reform phase covered the period from 1996/97 to 2010/11.The import duties on some selected luxury goods were further lowered to 30-40 percent and Export-led growth has been followed since 2004 (NBE, 2001).

With this, the country witnessed fast economic growth for eight consecutive years registering a strong economic growth for the 8th time in 2010/11. Likewise, the import of the country has also been rising since the early 1990s. Over the period 1960/61 to 1972/4, the country witnessed average real growth rates of 3.8 and 4 for GDP and total import bills, respectively. The growth rate of GDP fall to 1.9 percent and that of import rose to 8.3 percent over the period 1973/74 to 1990/91.In the period 1990/91 -1999/2000, the average growth rates of both import bills and real GDP rose to 20.1 and 4.6 respectively (NBE, 2011).

Between 2000/01 and 2008/09, the average growth rates of real GDP and real imports were 8% and 14% respectively[1]. Total import bill stood at USD 7.7 billion in 2008/09 due to the increase in the value of import items like semi-finished goods (7.6 percent), fuel (4.3 percent), capital goods (16.6 percent) and consumer goods (5.5 percent), offsetting the 40 percent slowdown in raw materials import as a result of which the share of imports in total GDP rose to 26.5 percent from 24 percent a year ago. This figure reached at USD 8.3 in 2009/10 with a marginal decline

[1] The growth rates of real GDP and imports during this period are calculated using MoFED(2012) data

of 0.8 percent due to the decline in import items like raw materials, capital goods and consumer goods. Import bills of other commodities, particularly fuel, however, increased that the share of imports in total GDP increased to 29.6 percent from 27.8 percent. This being the case, the growth rate of real GDP rose to 11.4 percent in 2010/11 the 10.4 percent growth rate in 2009/10, placing Ethiopia among the top performing African and other developing Asian countries (NBE, 2010/11).

1. 2. Statement of the Problem

The rising trend in imports since the early 1990s along with the growth in GDP raises five questions: Why has the import of the country kept on increasing despite the then ISI and the devaluation policies of Ethiopia? Is the relationship between import and real GDP for granted to be positive? What variables, other than real GDP and exchange rate, can explain the growth in imports? And to what extent have other studies on the import demand behavior of the country addressed this seemingly contradictory scenario? Why is the analysis of import demand behavior so important?

One of the major concerns in the formulation of trade and/or exchange rate policies is the responsiveness of trade flows to relative price changes and income variations. The effect of trade and exchange rate policies is highly dependent upon the size of estimated price and income elasticities of both export and import for they provide a crucial link between economies, and exhibit the extent to which the external balance constraint affects a country's growth performance. Hence, international economists have devoted a considerable amount of effort to the estimation of import demand functions, both at the aggregated and disaggregated levels (Egwaikhide, 1999). Among others, the empirical investigations of Moran (1989), Yuan and Kochhar (1994), Senhadji (1997), Egwaikhide (1999), Rehman et al (2007), Yue (2010) and Sultan (2011) have provided considerable insights into the quantitative effects of changes in the availability of foreign exchange earnings, international reserves, openness of the economy (as measured by the effective rate of protection), relative prices, exchange rate and real domestic output on the growth of total imports.

Studies conducted on import demand function in Ethiopia have come up with quite controversial conclusions. Girma (1982), Solomon (2000) and Sewasew (2002), for instance, found a positive significant effect of real income (as proxied by real GDP) on import of goods. Conversely, Muluneh (1982) and Alem (1995) have found that the impact of real GDP on imports is negative and significant. Moreover, Tura (2001) found insignificant relationship between real income and import volume in the long run though he found a significant positive relationship in the short run. Moreover, Sewasew (2002) established only a short run relationship between imports and GDP.

The drawbacks of some of these studies lie in the small number of observations, a few variables or/and in the method of estimation they used. For instance, Girma (1982) used only 9 years, Muluneh (1982) used only 16 years and Alem (1995) used only 23 years of time series data. These studies employed the Engle-Granger two-step procedure and failed to test for the stationarity of the data. It is important, however, to note that small sample sizes and non-stationary time series data tends to produce a highly spurious or false result while Engle-Granger two-step approach fails to test for the presence of more than one cointegrating relationships (Gujarati, 1995). Equally important is that these studies tried to model imports as a function of only one or two variables ignoring supply side factors such as foreign exchange reserves. In the models of Girma (1982), Alem (1995) and Tura (2001), GDP is the only explanatory variable; and GDP and foreign exchange reserve are the only explanatory variables in the model of Muluneh (1982).

Even though Sewasew (2002) and Yohaness (2011) used Johansen maximum likelihood approach, their main objective was not the estimation of the country's import demand equation. Besides, there has now been over two decades since most of these studies are conducted and thus, failing to cover the recent economic growth episode decade of the nation would be vain.

The gaps and the conflicting results observed in the studies conducted on the import demand behaviour together with the hardly available recent estimates for the aggregate import demand function of Ethiopia motivate this study. That is, this study shows the defects of estimating a single import demand equation and attempts to bridge the gaps in the previous studies by employing a VAR cointegration analysis of 40 recent observations for five variables.

1.3. Objectives of the Study

The study generally aims at the empirical analysis of the determinants of Ethiopia's import demand.

The study specifically aims at

- empirically investigating the short run and the long run relationships among import demand, domestic income, domestic price level, foreign exchange reserve and exchange rate;
- looking for a causality from domestic income, inflation, foreign exchange reserves and exchange rate to imports; and
- testing for the usefulness of the import demand equation for policy purpose.

1.4. Significance of the Study

Policy questions in the areas of gross domestic product forecasting and the impact of exchange rate changes on the current account balance arise almost daily in the work of Central and development banks of individual countries and multilateral organizations such as the IMF and the World Bank (Senhadji, 1997).This is to mean that a substantive analysis of the components of the balance of payments is required to forecast the level of foreign reserves. This in turn requires an examination of changes in the current account and the capital account for it is through them that the improvements in the balance of payments evolve. A positive change in the current account is determined partly by a reduction in imports or an expansion in exports. It is, therefore, important for policymakers to identify the trends in at least this element of the trade account in order to better predict the desired level of foreign reserves.

A good understanding of import demand also helps to formulate policy on current and capital account liberalization in Ethiopia. It is highly likely that the import of capital goods affects the balance of payments our economy. For instance, knowing the extent to which changes in economic activity (as measured by real GDP) decrease or increase the amount of foreign currency flowing from the country as import payments is vital. Thus, having at hand a model that facilitates the projection of these amounts is a useful tool to foresee whereabouts of the balance of payments.

These being the cases; however, scarcely any studies have obtained reliable estimates on the determinants of aggregate imports for Ethiopia as of recently and the studies conducted so far can also be criticized on the basis of the Single-Equation-Estimation-Approach, the small number of samples or the few variables they used.

The current study, therefore, provides an import demand model from a VAR approach instead of the Engle-Ganger's Single-Equation-Estimation-Approach. It will also contribute to the existing empirical literatures on the nation's import demand by pulling out other similar works in the arena. It would, finally, help us draw important policy lessons.

1.5. Scope of the Study

This study is restricted to the analysis of the determinants of Ethiopia's import demand over the period 1970/71 and 2010/11. It only includes domestic income, domestic price level, foreign exchange reserves and exchange rate as determinants of imports in order to avoid statistical complications.

1.6. Limitations of the Study

Though this study sheds light on the country's import demand, it suffered from the following limitations.

First, the recent two years of fast economic growth rates are missing from the analysis since the consolidated series is not yet available.

Second, the data reported by different institutions and by different departments within a single institution are inconsistent.

1.7. Organization of the Paper

The rest of the paper is organized as follows. The first section of chapter two presents theoretical literatures at the general level while its second section summarizes empirical literatures on the import demand behaviour in other countries in general and in Ethiopia in particular along the gaps observed. In chapter three, Import demand models specifications and description of variables, sources of data and methods used for testing and estimating the specified models are

presented. In chapter four, the trends, the structures and the origins of imports; and the impacts of real GDP, domestic price level, foreign exchange reserves and exchange rate on imports are described. The empirical findings of the study are presented and discussed in chapter five. Chapter six portrays the conclusions and the policy implications drawn from the study as well as the rooms available for further research.

CHAPTER TWO

RELATED LITERATURE REVIEW

This chapter provides theoretical and empirical frameworks for the study by reviewing related literatures on the import demand behavior in two broad sections. The first section presents theoretical literatures on the arguments for and against imports, Import Substitution Industrialization and the theories on Import demand functions. The second section is devoted to the reviews of empirical studies in other countries at large and in Ethiopia, along the gaps observed, in particular. By intervening in each section, the researcher picks the gaps witnessed in the empirical studies and shows those to be bridged by this study.

2.1. Theoretical Literature Review

The issue of imports has long been an area of debate to many scholars and researchers. This has chiefly emanated from the divergence between theoretical arguments and empirical findings. Most schools of thought argue that imports promote economic growth, at least at the nascent stages of development. Critics, on the other hand, stood against imports for they believe that imports have rather contractionary effects. As of the critics, Industrialization through Import Substitution Stategy can help cut imports. With this flavor, the subsequent sections present a review of theoretical literatures on this hot debate; and on theories of the import demand Function.

2.1.1. Arguments for and against Imports

Mercantilism, which was known as Colbertism in France and Kameralism in Germany, was the economic doctrine of the 17^{th} and 18^{th} centuries that stood against imports. The main feature of the mercantilist doctrine was that a country could grow rich and prosperous by acquiring more and more precious metals especially gold that all the efforts of the state should be directed to such economic activities that help a country to acquire more and more precious metals. This school firmly believes that people might exchange gold for commodities of daily use or require for a luxurious living if international trade is not properly regulated; and this would lead to the depletion of the stock of precious metals within the nation. Thus, exports were viewed favorably

so long as they brought in gold but imports were looked at with apprehension as depriving the country of its true source of riches, precious metals (Salvatore, 1990). This nationalistic view of mercantilists seems groundless for developing countries like Ethiopia for their industries are highly dependent upon the imports of intermediate and capital goods. Let alone industry, their agricultural sector depends on imports of fertilizer and agricultural machines. The service sector too depends on imports. This being the case, excessive import restriction would mean lower income and lower income has a multiplier effect and thus, such a theory fails to have any empirical support in Ethiopia in particular.

Adam smith, in his Wealth of nations (1776), challenged the mercantilists views on what constituted the 'Wealth of Nations'; and what contributed to "nation building" or increasing the wealth and welfare of nations. He provided the basic building block for the construction of the classical theory of international trade. He enunciated the theory in terms of what is called Absolute Advantage. Smith was the first economist to show that goods, rather than gold (or treasure), were the true measure of the wealth of a nation. He argued that the wealth of a nation would expand most rapidly if the government would abandon mercantilist controls over foreign trade. Smith also exploded the mercantilist myth that, in international trade, one country gains at the cost of other countries. He showed how all countries would gain from international trade through international division of labor. Smith argued that a country has to specialize in the production and export of the good for which it has an absolute cost advantage over the other country and import the good for which it has an absolute cost disadvantage over the other country that both nations will certainly benefit from consumption and production(Salvatore, 1990).Just as a tailor does not make his own shoes but exchanges a suit for shoes, and hence both the tailor and the shoe maker gain by trading, in the same manner, Smith argued that a country as a whole would gain by having trade relations with other countries . If one country has an absolute advantage over another in one line of production, and the other country has an absolute advantage over the first country in another line of production, then both countries would gain by trading.

David Ricardo (1817) articulated and expanded Smith's theory of absolute Advantage and came up with the theory of comparative advantage argument, which was later modified by Haberler in

1936 with an opportunity cost theory. For Ricardo, trade between two countries can benefit both countries if each country exports the goods in which it has a comparative advantage. A country is said to have a comparative advantage in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries. Ricardo's theory of comparative advantage states that a country has to specialize in the production and export of the good for which it has either a larger comparative advantage or smaller comparative disadvantage over the other country and it has to import the good for which it has either a smaller comparative advantage or a larger comparative disadvantage over the other country. Such a trade relation will benefit both trading countries (Krugman and Obstfeld, 2003).

Ricardo's argument has a theoretical relevance for nature has distributed the factors of production unequally over the surface of the earth. Countries differ in terms of natural resource endowments, climatic conditions, mineral resources and mines, labor, capital, technological capabilities, entrepreneurial and management skills, and other variables that determine the capacities of countries to produce goods and services. All these differences in production possibilities lead to situations where some countries can produce some goods and services more efficiently than others; and no country can produce all the goods and services in the most efficient manner. For example, Japan can produce automobiles or electronic goods more efficiently than any other country in the world; Malaysia can produce rubber and palm oil more efficiently than other countries can do. Their capacity to produce these goods is in excess of their capacity of their home consumption. Japan and Malaysia can, therefore, export these goods to other countries at relatively lower prices. Brazil, Ethiopia or Thailand can import these goods at a lower price from Japan and Malaysia and in return they can export coffee (Ethiopia and Brazil) and rice (Thailand) since Brazil and Ethiopia can produce coffee at much lower production costs and Thailand can produce rice at much lower cost than Japan and Malaysia.

Ricardo's statement, however, is not about what will actually happen. It is about possibilities. He stipulated that a country should export the commodity in which its absolute advantage is greater and import the commodity in which its absolute advantage is smaller. In the real world, the assumption of homogeneous labor is not valid since the level of skills of labor is different and labor is not the only factor of production. Ricardo did not mention the other factor of production,

capital. Thus, absolute advantage depends not only on labor value but also on capital value. In his view, import assists output growth if a country imports a commodity in which its absolute disadvantage is greater. Furthermore, the theory of comparative advantage rests on the assumption of free trade. In the Macmillan Committee (1931), the late Lord Keynes put forward the opinion that protection and not free trade was needed to restore the much-needed economic stability for an economy which is out of gear. Protection is deemed to make the domestic economy immune from the destabilizing effects of external disturbing factors. Protecting home industry is essential for economic development and to lower trade deficit in the country's balance of payments (the shortage of foreign earnings over the country's expenditure abroad) as a result of which most developing countries opted for substitution of imports with domestic production.

2.1.2. Industrialization through Import Substitution (ISI): Theory and Evidence

Though the policy of industrialization through import substitution (ISI) was dominant strategy for economic development during the 1950s and 1960s, the infant industry protection argument was one of the oldest arguments. Import substitution industrialization (ISI) is simply the Industrial development program based on the protection of home infant industries from low cost foreign producers through protective tariffs, import quotas, exchange rate controls, special preferential licensing for capital goods imports, and subsidize loans to local infant industries (Dike et al, 2011).It stresses on the importance of protection at the initial stage of production since cost per unit of output is high and argues that protection should be avoided after the domestic industries are able to compete with foreign producers and achieve economies of scale.

Early Mercantilists were one of the proponents of infant industry protection. They favored protection not because they wanted to promote the interest of the working class or to provide home market for produces or to diversify industries and to provide employment to all classes, but because they aimed at maintaining favorable balance of trade and to keep the debit side of international balance sheet as low as possible. Duties were also levied for encouraging the manufacture of certain commodities, which might fetch an export market and might help to swell the credit side of the balance sheet (Hajela, 1994).

Mercantilists imposed two types of restrictions upon the imports of commodities for securing favorable balance of payments. These are productive duties, i.e. restrictions based upon the imports of those commodities which can be produced at home, and restrictions on those commodities which are imported from other countries for which the balance of trade is adverse. Productive duties may give encouragement to any particular industry and may channelize labor and capital in that direction. Since industry is limited by capital, such restrictions cannot result in increasing the quantity of industry beyond the limit set by capital. The result would be that labor and capital will be diverted from one trade to another. And such diversion will always be from more advantageous channels for two reasons. First, the merchant, owing to considerations of security, will prefer to invest his money in home trade rather than in foreign trade, or in the foreign trade of consumption goods rather than in the transport trade. Second, since individual wants to earn profit, he would use his capital where the produce is likely to be of the greatest value (Smith, 1776, cited in Hajela (1994)).

The empirical literature on industrial transitions in developing countries reveals that the East Asian countries used ISI to build up a vibrant industrial technological competence. Starting with the low- skill- labour intensive manufactures, these countries gradually moved on to manufacture more technologically complex products for export exploiting competencies and skills acquired in the courses of the ISI phase. Republic of Korea, Taiwan, Singapore and Hong Kong began their industrial catch-up in the 1950s through the 1970s; Malaysia, Thailand and Indonesia followed them later in the 1970s through the 1980s; and, currently, China, Vietnam and India (in South Asia) are cruising at high attitude in the same style as in the industrialization catching-up game. These countries have followed protectionist industrial policy. With the exception of Hong Kong and Singapore, they turned to import protection through tariffs and quantitative barriers and restricted foreign investment, but utilized incentives and exchange rate policies to promote exports. Taiwan (China) moved to export- orientation in 1958; and introduced duty exemption schemes, bonded factories and export processing zones to promote FDI for export. Korea followed in the mid 1960s, but kept a more restrictive regime for foreign investment. Trade regimes in Hong Kong and Singapore were more liberal due to their traditional role as trade hubs though Singapore has followed a selective approach to Foreign Direct Investment. Indonesia, Thailand, and Malaysia followed import-substitution strategies, and started promoting exports,

reducing trade protection, and especially, offering incentives to FDI in the 1980s. Taiwan, China, and Korea have also liberalized their economies significantly since then. China also reduced tariffs and started to open to foreign investment in that period. Since then, the growth in East Asian exports in global trade has been spectacular, rising from 9 percent in 1980-85 to 18 percent in 1997 (Dike et al,2011).

Sub-Saharan Africa embarked on ISI as early as the post war II decades, consolidating that process in the post-colonial decades of the 1960's and 1970's and employing a protectionist industrial policy .With the possible exception of Mauritius, no Sub-Saharan African country has undergone an industrial revolution in the style of the East Asian newly industrializing countries (NICs) and this led to two contrasting perspectives in the development literature ,namely the neo-liberalism (neo-classicalism) and structuralism or neo-Keynesians (Ibid).Contrary to this argument is that restriction of import leads to the decline of imported inputs essential to the export sector, further discouraging export promotion and therefore leading to the decline of the growth of GDP (Jebuni et al, 1994). Thus, the policy of import substitution affects the export sector in less developing countries like Ethiopia and this policy has anti-export bias where the industry is import dependent (Lyakurwa, 1991). The other view is that the protected industry expands at the cost of other industries, and its production growth is less than the fall in production elsewhere (Salvatore, 1990). Therefore, the net effect may be negative. Even empirically, there is weak evidence that support import substitution strategy (Dornbush, 1992).

Despite the earliest available support for import substitution strategy, the situation is changing currently. There appears to be an agreement that trade promotes growth by enabling countries acquire goods that they have no capacity to produce. Thus, liberalization of trade and payments removes anti-export bias, and this promotes the export sector and therefore leads to the improvement of foreign earnings and growth of GDP. Therefore, import liberalization (not in its strict sense) is important to help export sector, given the fact that countries like Ethiopia, among the developing countries, are highly dependent on imports from developed economies.

In broad classification, most of the goods imported by developing countries include capital, intermediate and consumer goods. It is widely argued that the importation of capital and

intermediate goods has substantial impact for the development of these economies. However, the effect of imported consumer goods on GDP growth is not clear (Moran, 1989; Sultan, 2011).

2.1.3. Theories on the Import Demand Function

Available literatures provide three major theories of the import demand function, namely the theory of comparative advantage, the Keynesian trade multiplier, and the new trade theory or the imperfect competition theory of trade (Hong, 1999).

The neoclassic import demand function is based on the assumptions of the neoclassic microeconomic consumer behaviour and general equilibrium theory. The Keynesian import demand function, on the other hand, is based on macroeconomic multiplier analysis. In the Keynesian framework, relative prices are assumed to be rigid and employment is variable. Also, some international capital movements are assumed and that they passively adjust to restore the trade balance. The thrust of this framework is the relationship between income and import demand at the aggregate level (and in the short term). The relationship can be defined by a few ratios such as the average and marginal propensity to import and the income elasticity of imports.

The imperfect competition theory of trade is a relatively recent theory and focuses on intra-industry trade, a concept that is not well explained by the theory of comparative advantage. It explains the effects of economies of scale, product differentiation, and monopolistic competition on international trade and suggests a new link between trade and income as the role of income in determining imports goes beyond that defined in both the neoclassic and Keynesian trade theory models.

2.2. Empirical Literatures

The early empirical works on import demand have specified imports as functions of relative prices and real activity variables such as GNP or industry output. On the other extreme, import models like that of Hemphill (1974) ignore these demand side factors on the basis of the proposition that changes in relative prices and real economic activity can be measured by the changes in foreign exchange reserves since changes in imports cannot be fully explained by the changes in relative price and real economic variables in the presence of import and exchange

restrictions. Economists like Moran, on the other hand, have merged the traditional import model with that of Hemphill's import demand model. With this background, this section reviews available empirical literatures on import demand function in other counties in general and in Ethiopia in particular.

2.2.1. Studies in Other Countries

Khan (1974) tried to analyze the determinants of imports in fifteen developing countries using a two-stage estimation procedure for the period 1951-69 on the basis of traditional import demand function in which he related a country's import demand to demand side factors, real GDP and relative prices. He found that income elasticity of import is significantly different from zero and has positive sign at the five per cent level of significance for nine countries in the long run. In the short run, income elasticity of import is significant and positive only for four of those countries. Similarly, Goldstein and Khan (1976) estimates traditional import demand model for 12 industrial countries during the period 1955-1975 based on quarterly data using OLS and two-step estimation procedure and found that the income elasticity of import is significant and has a positive sign both in the long run and the short run.

The other work on the traditional import demand is that of Senhadji (1997). He estimated the traditional import demand equations for 77 developing countries using a time-series non-stationarity technique. His model differs from other traditional import demand models for he suggested GDPt- Xt (GDP minus export at time t) instead of the current activity variable (proxied by GDPt) as an explanatory variable in the aggregate imports model. His result demonstrates that the short-run and long-run income elasticities are less than 0.5 and close to 1.5, respectively and that the long run income elasticity of import for a large majority of countries has a positive sign, and is statistically significant in most cases. His comparison of industrial and developing countries exhibits a significantly higher income elasticity of imports in industrial countries than in developing countries. Although these traditional import demand models are able to provide measures of income and price elasticities, they assume that total imports consist of final commodities that are not separable from those other goods that serve as inputs to the consuming sectors. The other demerit of these models is that they are based on the assumption that there are no import restrictions implying the self correcting market mechanism of supply

equals demand. In practice, most LDCs use import restrictions such as tariffs and quotas and excluding these restrictions from any import demand model may lead to a biased result (Sultan, 2011).

Hemphill (1974) estimates import demand function for eight developing countries based on the traditional import model by giving attention to import capacity (measured by foreign exchange receipts and foreign exchange reserve) and import restriction. On the basis of the fact that there is high import restriction and the change in foreign exchange could measure changes in real income and relative prices, he argued that imports are insensitive to changes in income and relative prices in these developing countries and thus, he relates import demand to foreign exchange receipts and international reserve in his model. His result was consistent with theory that import is highly dependent on capacity variables. This view of Hemphill seems relevant for many developing countries, including Ethiopia, since foreign exchange constraints can be an important factor in the determination of imports; and government policy in the face of foreign exchange shortages can include changes in the exchange rate, and the imposition of tariffs or quantitative import restrictions or lack of capacity to import would affect directly both the relative price of imports and the volume of imports. But, there are evidences where the changes in demand side factors like demand real income growth and relative price affect imports demand , the capacity factors being ineffective. For instance, Mah (1997) finds that the exchange rate policy is ineffective in determining import demand in Korea. Thus, a model has to account for both the capacity and the demand side factors if it is to explain a good portion of an import demand model.

Opposed to Khan (1974) and Hemphill (1974) type models, Moran (1989) gives us a general import demand model. He put together both the traditional demand side activity factors model and Hemphill's capacity factors import demand model to estimate a general import demand model for twenty-one developing countries with a pooled cross-section time-series data over the period 1970-83. He used foreign exchange stock and flows as a measure for import capacity. Real income is found to be a significant determinant of imports though its estimated coefficient is smaller than that of foreign exchange receipts and international reserves in the long run. The short run income elasticity of import is found to be statistically significant in the short run as well. A comparison yields that the estimates of income elasticity of import in the traditional

model are statistically significant and are higher than the corresponding elasticity in this Moran's general import model. The other interesting result is that import capacity is more overriding factor for developing countries as compared to industrial nations. It is important to note that the model of Moran didn't escape criticism. Lopez and Thomas (1990), for instance, argued that the inclusion foreign exchange stock and flows as a measure of import capacity is equivalent to estimating something very close to identity and hence, used export-debt ratio as an indicator for import capacity and real effective exchange rate instead of the relative price in their estimation of an import demand model for seven SSA countries.

Mwega (1993), Gumede (2000), Ivohasina and Hamori (2005), Yuan and Kochhar (1994), Horton and Wilkinson (1989), Dwyer and Kent (1993), Sinha (1997), Egwaikhide (1999) , Rogers (2000), Rehman et al (2007), Yue (2010) and Sultan (2011) are some of the empirical works that followed Moran's generalization of import demand equation. Mwega (1993), for instance, estimates a generalized short-run dynamic import demand function for Kenya by applying an error correction model over the period 1964-1991. His result exhibits low import elasticities with respect to relative price and real income. He argued that stabilization and exchange rate policies would not bring about rapid amelioration of the external disequilibrium, and foreign exchange reserves appear to be the main determinant of imports.

Gumede (2000) examines aggregated and disaggregated import demand for South Africa in a framework of co-integration analysis. Similar to Mwega; he obtained a long-run relationship among the variables from the two-step Engle–Granger technique and introduced it into a short-run dynamic model. Income elasticity is found to be much larger than price elasticity. Ivohasina and Hamori (2005) analyzed the long-run relationship among the variables in the aggregate import demand functions for Madagascar and Mauritius in order to evaluate the appropriateness and effectiveness of the structural adjustment program (SAPs). They found the existence of co-integration relationship between the variables. The long-run income and price elasticities are respectively, 0.855 and -0.487 for Madagascar and 0.671 and -0.644 for Mauritius. On the basis of their result, they concluded that the stabilization and devaluation policies under the SAPs are effective in the reducing import demand.

Similarly, Yuan and Kochhar (1994) estimates general model to analyze the long-run and short-run determinants of Chinese imports for the period 1980-1992 with a quarterly data by applying Johansen's generalization of the co-integration and error-correction approach to time series analysis. Their model differs from that of Moran (1989) for it ignores international reserve and uses industrial output instead of GDP. Their result indicates a positive and significant output elasticity of aggregate import in the short run as well as in the long run, and that the short run output elasticity of import is greater than the long run. The long-run elasticity of imports with respect to industrial output, relative prices and reserves are estimated to be 0.5,-0.3 and 0.3 respectively while their estimated short run values are 1.77,-0.15 and -0.34 in the same order. In particular, the short-run elasticity of imports with respect to industrial production is considerably higher than its long-run value. The reason for this result, as of them, is that import substitution strategy played an important role over their sample period. That is, an increase in economic activity tends to lead to a surge in imports in the absence of domestically available substitutes in the short run (as implied by the higher elasticity of) and the lower long-run elasticities suggest that import substitution may be significant over longer periods of time. Their result too suggests a bi-causal relationship between imports and aggregate real income.

Horton and Wilkinson (1989) use the econometric technique of co-integration to model the aggregate import demand in Australia over the period 1974 -1989. Their result shows that movements in total and endogenous imports are well explained by movements in domestic demand, the relative price of imports, the relative price of exports, and the level of overtime. The demand for imports is found to be more responsive to changes in demand than to changes in prices, although movements in prices have an impact on import demand over a longer period of time. Their models explain almost all of the rapid growth of imports over the period from 1986 to 1989 for Australia; and over this period, they found that the contribution to growth in imports of relative prices outweighs that of demand. Christopher and Jacqueline (1993) attempted to explain the growth in Australia's imports in terms of the increased openness of the economy with a quarterly data over the period 1974 to 1994. They augmented the traditional import demand function with a term for the effective rate of assistance, with the latter as a proxy for openness. Whilst this term did not help explain the growth in aggregate imports, it did prove to be a significant explanatory of consumption and intermediate imports which account for the bulk of

the nation's total imports. Their results indicate that of the 47 per cent increase in consumption imports since the March quarter 1984, about 18 percentage points (or two fifths) are attributable to reductions in protection. They argued with evidence that the dismantling of protection was accompanied by a fall in the supply of domestic substitutes so that supply side constraints may have led to import growth. As of them, this result was attributed to the effect that changes in protection have on both the demand for imports and the supply of domestic substitutes and concluded that a substantial share of the growth in these imports could be explained by the reduction in protection.

Sinha (1997) estimates the aggregate import demand equation for Thailand using annual data for the period 1953-90 by applying a co-integration analysis. The model uses domestic price of import, price of import and real domestic GDP as regressors. The aggregate import demand for Thailand is found to be to be price inelastic (-0.24), cross price (with respect to domestic price) inelastic (0.097) and income inelastic (0.68). In the long run as well, aggregate import demand is price inelastic (-0.77) and cross price inelastic (0.30); but is highly income elastic in the long run. He explained that the relatively large price elasticity of import demand suggests that exchange rate policies are likely to be effective in dealing with balance of payments deficit; and the high income elasticity of imports will indicate that there may be a trade-off between economic growth and balance of payments deficit.

Egwaikhide (1999) estimated a generalized import model of Moran (1989) to find out the determinants of aggregate imports and its major components for Nigeria over the period 1953-1989 with Engle-Granger co-integration method. His model specification draws on both the traditional and the Hemphill import demand functions, while the estimation procedures take into consideration the recent developments in time series modeling. His model uses industrial output is as a regressor instead of GDP. The quantitative evidence of this study indicates that short-run changes in the availability of foreign exchange earnings, relative prices and real output significantly explain the growth of total imports during the period under investigation. As of this finding, particularly striking is the short-run impact of foreign exchange availability, which is tied to the long-run effect through a feedback mechanism. He concluded that despite the

important role played by these variables in sharpening import behaviour, the effect of foreign exchange availability is particularly remarkable.

Rogers (2000) studies the behaviour of Fiji's imports during the period 1968-1998 using import function on the basis of co-integration analysis and an error correction model to determine the long-run and the short-run elements of the relationship between the variables of the model. The model incorporates real GDP, import prices and real effective exchange rate variables (REER), as well as a measure for average tariffs. The result of the study shows that the aggregate import demand for Fiji is price inelastic (0.53), tariff inelastic (-0.02) and income inelastic (0.90) in the short run. In the long run as well, aggregate import demand is price inelastic (0.41) and but is income elastic (1.29), while tariffs are insignificant, with an implication that movements in domestic demand and the real effective exchange rate predominantly explain movements in imports. Unlike other studies, this study established a positive relationship between imports and their prices. In line with the 0.76 short-run coefficient of REER, the study suggests that a higher cost of imported goods, arising from the depreciation of the real effective exchange rate, likely causes a decline in the value and volume of goods imported.

Rehman et al (2007) estimated the aggregate import demand function for Pakistan by employing Johansen and Juselius (1990) multivariate co-integration and Error Correction Model techniques on the basis of annual data for the period 1975-2005.This study differs from other similar studies conducted in Pakistan for those studies used non-stationary data that their findings suffer from 'spurious regression.' Import price, real income and domestic price level are included as regressors in the model and the finding shows that there is long-run equilibrium relationship among these variables. Only income and import price elasticities are found to be significant in the long run. The sign of real income elasticity coefficient is found to be positive, which is interpreted as indicating that an increase in income leads to an increase in imports in the long run and vice versa. They regarded imports as necessary goods in Pakistan for they found inelastic long-run income elasticity. The sign of import prices, on the other hand, exhibits a negative relationship between import prices and level of imports in the long run. But, the level of imports is not affected by the level of real income, domestic price level and import prices in short run. The regression coefficients also indicate that the imports are less elastic with respect to income

and import prices in the long run. The adjustment coefficient is found to be negative and significant (–0.50) suggesting a 50% adjustment in total import demand towards equilibrium path occurs in each period in the sample used in the study. They have also considered the stability of coefficients tests indicate that import demand function remains stable over the sample period.

Yue (2010) examines a disaggregated import demand model for Cote d'Ivoire using time series data for the period 1970-2007 by employing an Autoregressive Distributed Lag (ARDL) modeling process to capture the effect of final consumption expenditure, investment expenditure, export expenditure and relative prices on import demand. The study established a long run co-integration relationship between the variables and found that the long-run and the short-run impact of various expenditure components are inelastic and that all the estimated variables have their expected signs. It was found that 1 per cent increase in consumption expenditure will lead to 0.96 per cent rise in imports and also a 1 per cent increase in expenditure on export induces 0.51 per cent rise in imports. The impact of the expenditure on investment is relatively small. In the long run, investment and exports are the main determinant in Cote d'Ivoire imports. However, both components of expenditures are the major determinants of Import demand in the short run. Import demand is not sensitive to price changes though relative prices variable is negatively related with imports (-0.23).Stability tests are performed and the specified import demand function appeared to be stable.

Ulke and Ergun (2011) investigate the relationship between inflation and import volume by using monthly time series data for the Turkish economy over the period 1995 to 2010. In the study, existence of a co-integration and dynamic relationship and causality between import and inflation is tested by employing econometric methods such as co-integration, error correction model and Granger causality and the test results indicate that; (a) long-run and dynamic relationships are found between inflation and import, (b) there is unidirectional causality from import to inflation.

Sultan (2011) investigates the aggregate import demand function for India using Johansen's co integration method. After analyzing the size of the coefficients, he found domestic income to be the most important factor determining the volume of import both in long run and short run. His

long run result shows an equilibrium relationship between real imports, real income, relative price of imports and real foreign exchange reserves. In the long run, import is found to be elastic with respect to income, and inelastic with respect to relative price and foreign reserves. He attributed this result to the fact that the import volume would grow at faster rate than the growth in income of the country and would deteriorate the trade balance of the country if the growth in income is not accompanied by growth in exports. Foreign exchange reserves and relative prices of imports are also significantly related to import both in the long run and in the short run. The economic impact of foreign exchange reserves is relatively small in particular to the size of the estimated income elasticity but is close to price elasticity. He found a low coefficient for relative import prices, which implies that India's import is non competitive in nature and import substitution industrialization (ISI) strategy has not been able to successfully provide the domestic substitutes to these products to compete with imports. In his short run result, import is found to be inelastic with respect to all of his model variables.

2.2.2. Studies in Ethiopia

In Ethiopia, Muluneh (1982), Girma (1982), Alem (1995), Solomon (2000), Tura (2001) Sewasew (2002) and Yohaness (2011) have tried to estimate import demand equations.

Girma (1982) specified the value of import only as a function of GDP for the period from 1970 to 1978. His OLS estimation result shows that real GDP has a significant positive effect on import of goods in the country. With the same method of estimation, Muluneh (1982) respecified the import demand equation for Ethiopia as a function of GDP and foreign exchange reserves for the period from1965-1980.His findings show that income elasticity of aggregate import is negative and significant.

On the basis of the Engle-Granger cointegration Approach, Alem (1995) estimated a generalized import demand model for Ethiopia over the period from 1969 to 1991. Income (real GDP) is used as an explanatory and the finding indicates that income elasticity of imports is negative and weakly significant (only at 10 percent level of significance) in the long run though it is negative and statistically significant in the short run. This study attributed the negative income elasticity of import to the fact that domestic goods substitutes imported goods as income increases.

Sewasew (2002) estimated a Moran (1989) type model relating import to real GDP, relative prices, foreign exchange receipts and international reserves with Cointegration and error correction mechanisms over the period from 1960/61to 1999/2000.He found a similar result to that of Solomon (2000) and Alem (1995), both of which found positive price elasticity of import in the long run. His result indicates that the short run coefficient of real GDP is higher than the long run coefficient, implying lower import substitution scheme in sample period in the short run. He reasoned out this result that as income increases, most people spend their income on domestic goods. As of this study, imports are non responsive to changes in real income, but are affected by international reserves in the long run. In the short run, import positively depends on real GDP and on foreign receipts, and negatively on relative prices. With regard to exchange rate, he explained, in the long run, that devaluation of local currency may not reduce import demand for most of Ethiopia's import goods consist of capital and intermediate goods. One critical point of this finding lies in the comparison between long run and short coefficients of real domestic income. The long run coefficient of real income is statistically insignificant which means that the coefficient is not different from zero and comparing this to a statistically significant coefficient is something vain.

Yohaness (2011) specified Ethiopia's imports as a ratio of GDP as a function of terms of trade, aid as a ratio of GDP, exports as a ratio of GDP, real exchange rate(REER) as a ratio of GDP and real GDP and estimated it using Johansen maximum likelihood approach over the period of 1970/71 to 2008/09. He showed that export and aid, each as a ratio of GDP, and real GDP are positive and significant in affecting import in the long run. Terms of trade, export and REER are found to have a significant impact on import in the short run. The problem in this study is that statistically insignificant coefficients are interpreted as being negative or positive. Besides, foreign exchange reserve, which is an important import capacity factor, is missing from the model.

2.2.3. Gaps Observed in the Studies on Ethiopia

One can criticize the studies conducted on the import demand function in Ethiopia on the basis of sample size or sample periods, methods of estimation and variables included in their models.

Except Solomon (2000) ; Sewasew (2002) and Yohaness (2011), the rest of the studies presented in the previous section included only one or two explanatory variables in their import models; and employed a single equation estimation method, which, unlike VAR approach, presumably treats imports as endogenous to a system. Most of them share a common problem for they are restricted to the sample periods before the fiscal year 1999/2000. Though Solomon (2000) and other similar studies used a cointegration analysis approach, they too fall short of not including more than two or three variables in their model.

Despite their uses of the Johansen maximum likelihood approach, the main objective of Sewasew (2002) or Yohaness (2011) is not the estimation of the country's import demand equation. Besides, there has now been over a decade since most of these studies are conducted. These facts, therefore, leave a room on the need to study the import demand behavior of the country and this lays the benchmark for the ongoing study.

CHAPTER THREE

MODEL SPECIFICATION AND METHODOLOGY

This chapter is organized into three sections. The first section gives the appropriate VAR and VEC models specified to analyze the determinants of imports in Ethiopia. In the mean time, the brief description of variables along with their hypothesized theoretical signs is formulated. For a comparison purpose, the Partial Adjustment import demand model is also derived. The second section presents the sources and types of data for the variables used in constructing the model. The chapter, finally, presents and describes the econometric methods of analysis employed for presenting and discussing the findings of the study.

3.1. Model Specification

Most of the earliest econometric investigations of import demand function specify import as function of real income or industrial output of a country and relative price of import, the ratio of unit value of imports of the country to domestic price level, (Leamer and Stern, 1970; Khan (1974); Goldstein and Khan, 1976; Carone, 1996; Senhadji, 1997). On the other hand, there are models that give more attention to import capacity which can be measured by foreign exchange receipts and foreign exchange reserve and import restrictions. Hemphill (1974), for instance, relates import demand to foreign exchange receipts and international reserve in his model on the basis of proposition that high import restrictions and the changes in foreign exchange could measure changes in real income and relative prices. His result was consistent with the theory that import is highly dependent on capacity variables. There are also evidences where the changes in demand side factors like real income growth and relative price affect imports demand while the capacity factors are ineffective. For instance, Mah (1997) found that the exchange rate policy is ineffective in determining import demand in Korea.

In between are empirical works that account for both demand side and supply side factors. For instance, Rogers (2000) incorporates real GDP, import prices, real effective exchange rate and a measure for average tariffs in his study of Fiji's imports behaviour during the period 1968-1998. His result shows that movements in domestic demand and real effective exchange rate predominantly explain the movements in imports. Similarly, Sultan (2011) includes foreign

exchange reserves, in addition to the real income and relative prices of imports, in his analysis of India's import demand function with a proposition that foreign exchange reserve (FER) is the only medium of exchange in international market and acts as a constraint for India to import necessary inputs; and that the desired level of import cannot be actualized in the absence of sufficient level of FER reserves.

It can now be inferred that omitting either the demand side or the supply variables may result in bias of a model's estimates and tends to overstate the importance of the included variables. Accordingly, Moran's (1989) import demand model, which has modified Hemphill's (1974) Stock Adjustment Import-Exchange Model, forms the theoretical basis for the import demand model of this study. Following Moran's generalization of Hemphill's model, the model is specified to be:

$$\ln(M_t) = \beta_0 + \beta_1 \ln(Y_t) + \beta_2 \ln(P_t) + \beta_3 \ln(R_t) + \beta_4 \ln(ER_t) + \varepsilon_t \qquad (3.1)$$

Where, M is the value of Imports

P is the general domestic Price level (proxied by CPI);

Y is an index of real economic activity (proxied by GDP);

R is the level of foreign exchange reserves;

ER is the real effective exchange rate; and

t refers to the time period.

3.1.1. VAR and VEC Models

One problem with the specification in equation (3.1) is that it tends to treat imports as the only endogenous variable to the system. But, it is equally logical to argue that imports can have impacts on other variables of the model. Thus, a VAR approach, where all variables are assumed to be endogenous to the system, should be used. In a VAR, each endogenous variable is explained by its past values; and the lagged and current values of all other endogenous variables in the model and usually, there are no exogenous variables in such a model (Gujarati, 2004).

The VAR specification of equation (3.1) takes the form:

$$M_t = \alpha_0 + \sum_{i=1}^{q} \alpha_1 M_{t-i} + \sum_{i=0}^{q} \alpha_2 Y_{t-i} + \sum_{i=0}^{q} \alpha_3 P_{t-i} + \sum_{i=0}^{q} \alpha_4 R_{t-i} + \sum_{i=0}^{q} \alpha_5 ER_{t-i} + \upsilon_{1t}$$

$$Y_t = \beta_0 + \sum_{i=1}^{q} \beta_1 Y_{t-i} + \sum_{i=0}^{q} \beta_2 M_{t-i} + \sum_{i=0}^{q} \beta_3 P_{t-i} + \sum_{i=0}^{q} \beta_4 R_{t-i} + \sum_{i=0}^{q} \beta_5 ER_{t-i} + \upsilon_{2t}$$

$$P_t = \theta_0 + \sum_{i=1}^{q} \theta_1 P_{t-i} + \sum_{i=0}^{q} \theta_2 Y_{t-i} + \sum_{i=0}^{q} \theta_3 P_{t-i} + \sum_{i=0}^{q} \theta_4 R_{t-i} + \sum_{i=0}^{q} \theta_5 ER_{t-i} + \upsilon_{3t}$$

$$R_t = \gamma_0 + \sum_{i=1}^{q} \gamma_1 R_{t-i} + \sum_{i=0}^{q} \gamma_2 Y_{t-i} + \sum_{i=0}^{q} \gamma_3 P_{t-i} + \sum_{i=0}^{q} \gamma_4 R_{t-i} + \sum_{i=0}^{q} \gamma_5 ER_{t-i} + \upsilon_{3t}$$

$$ER_t = \vartheta_0 + \sum_{i=1}^{q} \vartheta_1 ER_{t-i} + \sum_{i=0}^{q} \vartheta_2 Y_{t-i} + \sum_{i=0}^{q} \vartheta_3 P_{t-i} + \sum_{i=0}^{q} \vartheta_4 R_{t-i} + \sum_{i=0}^{q} \vartheta_5 M_{t-i} + \upsilon_{4t}$$

Where all variables are in logarithms and q is the optimal lag length to be selected with an appropriate information criterion.

If the presence of cointegration is established, then follows the estimation of the Vector Error Correction (VEC) Model that includes both the long run and the short run information. This error correction mechanism (ECT) can be inserted in the following unrestricted short run equation as:

$$\Delta M_t = \eta_0 + \sum_{i=1}^{n} \eta_{1i} \Delta M_{t-i} + \sum_{i=0}^{n} \eta_{2i} \Delta Y_{t-i} + \sum_{i=0}^{n} \eta_{3i} \Delta P_{t-i} + \sum_{i=0}^{n} \eta_{4i} \Delta R_{t-i} + \sum_{i=0}^{n} \eta_{5i} \Delta ER_{t-i} + \mu ECT_{t-1} + \varepsilon_t \qquad (3.3)$$

Where n is the optimal lag length and Δ is the first difference operator

Equation (3.3) has a one period lagged error correction term, (ECT_{t-1}). The coefficient of this term (μ) is feedback effect or the adjustment effect that measures the speed of adjustment to long run equilibrium condition (i.e. the extent of the disequilibrium created in previous period that is

corrected in period t).Note that there are as many error correction terms as are the number of cointegrating vectors (sultan, 2011). The first difference lagged regressors, the coefficients of which are $\eta_{2i}, \eta_{3i}, \eta_{4i}$ and η_{5i} ,are impact multipliers or short run effects measuring the immediate impact of the change in the regressors (Y_t, P_t, R_t and ER_t respectively) on the dependent variable (M_t).

Since the error correction model in equation (3.3) has a tendency of being over parameterized, Hendry's general-to-specific model selection technique, in which insignificant lags are dropped, would be pursued to obtain a parsimonious (an interpretable) error-correction model.

3.1.2. Partial Adjustment Import Demand Model

Most empirical studies employ the Partial Adjustment model for estimating import demand functions. But, the choice of a model has to depend on its forecasting ability (Yuan and Kochhar, 1994). Thus, the Partial Adjustment model for import demand is derived in this sub-section and its forecasting ability is compared with that of the VECM in Chapter Five.

The Partial Adjustment Model can be defined as a model in which economic agents cannot adjust fully to changing conditions. In this particular case, the partial adjustment import demand model is defined as a model in which the current imports are regressed on the first lag of imports, and on the level (current) forms of other explanatory variables (Yuan and Kochhar, 1994; Sultan, 2011).

Following Khan and Ross (1977), the partial adjustment model for imports for this study can be specified as:

$$\Delta M_t = \delta(M_t^* - M_{t-1}) \quad (3.4)$$

$$M_t^* = \alpha_1 + \alpha_2 Y_t + \alpha_3 P_t + \alpha_4 R_t + \alpha_5 ER_t + \nu_t \quad (3.5)$$

Where,

M_t^* is the desired level of imports.

Δ is a first difference operator ($i.e. \Delta M_t = M_t - M_{t-1}$)

δ is the coefficient of adjustment with a magnitude of less than unity ($0 < \delta < 1$)

Substituting (3.5) into (3.4) and rearranging yields

$$Mt = \delta\alpha_1 + \delta\alpha_2 Y_t + \delta\alpha_3 P_t + \delta\alpha_4 R_t + \delta\alpha_5 ER_t + (1-\delta)M_{t-1} + \delta v_t \quad (3.6)$$

We can rewrite equation (3.6) to produce the following dynamic linear import demand equation

$$M_t = \omega_1 + \omega_2 Y_t + \omega_3 P_t + \omega_4 R_t + \omega_5 ER_t + \omega_6 M_{t-1} + \varphi_t \quad (3.7)$$

Where $\omega_1 = \delta\alpha_1, \omega_2 = \delta\alpha_2, \omega_3 = \delta\alpha_3, \omega_4 = \delta\alpha_4, \omega_5 = \delta\alpha_5, \omega_6 = (1-\delta)$ & $\varphi_t = \delta v_t$

In a similar fashion, we can drive the log-linear form of the partial adjustment import demand model as follows:

$$\Delta \ln M_t = \square(\ln M_t^* - \ln M_{t-1}) \quad \text{, where } 0 < \phi \leq 1 \quad (3.8)$$

$$\ln\ln M_t^* = \beta_1 + \beta_2 \ln Y_t + \beta_3 \ln P_t + \beta_4 \ln R_t + \beta_5 \ln ER_t + \varepsilon_t \quad (3.9)$$

Substituting (3.9) into (3.8) and rearranging yields

$$\ln M_t = \phi\beta_1 + \phi\beta_2 \ln Y_t + \phi\beta_3 \ln P_t + \phi\beta_4 \ln R_t + \phi\beta_5 \ln ER_t + (1-\phi)M_{t-1} + \phi\varepsilon_t \quad (3.10)$$

Equation (3.10) can be rewritten as:

$$lnMt = \alpha_1 + \alpha_2 lnY_t + \alpha_3 lnP_t + \alpha_4 lnR_t + \alpha_5 lnER_t + \alpha_6 M_{t-1} + \upsilon_t \quad (3.11)$$

$$where\ \alpha_1 = \phi\beta_1, \alpha_2 = \phi\beta_2, \alpha_{3=}\phi\beta_3, \alpha_4 = \phi\beta_4, \alpha_5 = \phi\beta_5, \alpha_6 = (1-\phi) \text{and } \upsilon_t = \phi\varepsilon_t$$

Equation (3.11) is the dynamic –linear demand equation. This is the partial import demand function which shows the observable relationship between Mt and its determinants.

It can now be seen that dropping lagged imports from equation (3.11) leaves us with the general import demand function specified in equation (3.1). Note that the coefficients of equations (3.11) and (3.9) will give us the short run and the long run elasticities respectively that it is possible to calculate the coefficients of equation (3.9) from the coefficients of equation (3.11) as:

$$\phi = 1 - \alpha_6; \beta_1 = {}^{\alpha_1}/_{(1-\alpha_6)}, \beta_2 = {}^{\alpha_2}/_{(1-\alpha_6)}, \beta_3 = {}^{\alpha_3}/_{(1-\alpha_6)}, \beta_4 = {}^{\alpha_4}/_{(1-\alpha_6)}, \beta_5 = {}^{\alpha_5}/_{(1-\alpha_6)},$$

3.1.3. Hypothesized Theoretical Signs of Variables

The theory of demand postulates a negative relationship between price of one good and the quantity demanded of another good provided that the two goods are complementary; and this relationship turns out to be positive if the two goods are substitutes under the ceteris paribus assumption. Thus, as the price of imports, in relation to the price of domestic substitutes, increases, we may expect a decrease in its demand, and vice versa. The increase in income (as measured by GDP) of the country would cause an increase in aggregate demand for imports. Yet, the relationship between the demand for import and GDP depends upon the source of growth in GDP. If the increase in GDP arises from an increase in production of import substitute goods, then import will have negative relation with GDP (Yuan and Kochhar, 1994).

Foreign exchange reserve is deemed to be a 'capacity factor' for it helps a country to make its demand effective. That is, in absence of foreign reserves, a country cannot make payment for imports whatsoever be the level of income and price. Higher reserves of a country would mean more capacity to import and vice versa.

Exchange rate devaluation is theoretically believed to have a discouraging effect on imports and an encouraging impact on exports. On the basis of these propositions and assuming that the world supply of export to Ethiopia is perfectly elastic, β_1 may take either a positive or a negative sign ($\beta_1>0$ or $\beta_1<0$) depending on the sources of growth of GDP, β_2 is expected to carry a negative or a positive sign for β_2 ($\beta_2<0$ or $\beta_2>0$) depending on the degree of product substitutability or complementarity; and we expect a positive sign for β_3 ($\beta_3 > 0$) and a negative sign for β_4 ($\beta_4<0$).

3.1.4. Functional Form of the Models

The log-linear form of the models is used in this study for the following reasons. First of all, such a form allows for interpreting the coefficients of the dependent variables directly as elasticity with respect to each of the explanatory variables. Second, it accommodates the problem of hetroskedasticity. Third, the log linear form takes care of the problem of multicollinearity (Rogers, 2007; Aziz, 2008; Sultan, 2011). It is important, however, to note that a functional form affects the explanatory power of the variable. Kmenta (1986),for instance, argued that the

misspecification of functional form may result in misspecification of error term, that in turn results in violation of assumption of OLS and hence, the efficiency and the biasness of a parameter.

3.2. Data Type and Sources

This study utterly employs a national level secondary data. The annual and quarterly bulletins of the National Bank of Ethiopia (NBE), and the Central Statistical Authority (CSA), the current Ministry of Finance and Economic Development (MoFED), the Ethiopian Investment Agency (EIA), Ethiopian Economic Association's Database 2012, and World Economic Outlook's Database 2011 and IMF's International Financial and Direction of Trade Statistics are the sources of data for the study. Books, Journals and Magazines have also served as supplementary sources of data.

3.3. Econometric Tests

3.3.1. Time series Characteristics of the Data

Conventionally, the import function specified in system (3.2) is estimated using ordinary least squares (OLS) method under the assumption of a stationary series. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed (Maddala, 1992;Harris, 1995; Gujarati,2004).Yet, the problem with most time series is non-stationarity (a random walk); and regressions based on such non-stationary time series data are often misleading for the reason that regressions based on such a series would give a spurious or a false result (Granger and Newbold, 1974;Phillips ,1986; Stock and Watson, 1988). Hence, the first step when using time series data is to conduct test of stationary using unit root test, which has become the most popular and widely used method over the past several years. Thus, Augmented Dickey- Fuller, the Phillips-Perron and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests will be employed to determine the stationarity property of the specified model variables.

The Augmented Dickey-Fuller (ADF) test is an extension of the Dickey-Fuller test (Dickey and Fuller, 1981) and entails estimating the following autoregressive process:

$$\Delta x_t = c_1 + \omega x_{t-1} + c_2 t + \sum_{i=1}^{\rho} d_i \Delta x_{t-i} + v_t \qquad (3.12)$$

Where, x is the relevant time series (M, Y, P, R or ER in this case); Δ is a first-difference operator, c_1 is the drift (constant) term; t is a time trend and p is the optimal lag length to be selected with an information criterion.

Non-stationary time series data may exhibit either a stochastic or a deterministic trend (Thomas, 1997). x_t is said to follow a stochastic trend (or is a difference stationary) if ω =0, $c_1 = 0$ and c_2=0 and becomes stationary by taking its first difference. Most economic time series are difference stationary. On the other hand, we say x_t follows a deterministic trend if $c_2 \neq 0$ and $\omega \neq 0$. A deterministic trend can be removed by regressing x_t on a time trend. The residuals from this regression will then be stationary. In nutshell, x_t is trend stationary if $|\omega| < 0$ and $c_2 \neq 0$ or is non stationary if $|\omega| \neq 0$.

ADF tests the null hypothesis (H_0) of a unit root $\omega = 0$ against the alternative hypothesis (H_1) of $\omega < 0$. Unit root testing is different from hypothesis testing in stationary models in that the asymptotic distributions of the test statistics are not N(0, 1) or $\chi^2(1)$ in general (Nielsen,2007). Consequently, Dickey and Fuller showed that the standard F and t- tests are not useful for testing hypothesis if the series is non-stationary and developed ADF test statistics. The null hypothesis of no unit root is rejected if the ADF test statistics (in absolute terms) is less than the critical values (in absolute terms). One weaknesses of this test is that the power of the test is subject to the lag length selection (Rao, 1994). Also, it is inferior to Philipp-Perron (PP) test for a unit root for it fails to consider the cases of heteroskedasticity and non-normality, which are frequently revealed in a raw data of time series variables. Moreover, it has a disadvantage over the PP-test when time series has serial correlation and structural break (Perron, 1989).

Phillips-Perron (1988) test is well suited for analyzing a time series whose differences may follow mixed ARMA (p, q) process of unknown order for it incorporates non-parametric element and entails estimating the following equation:

$$x_t = \hat{c}_0 + \hat{c}_1 x_{t-1} + \hat{c}_2 \left(t - \frac{T}{2}\right) + U_t \qquad (3.13)$$

Where T is the number of observations and U_t is the error term. If $\hat{c}_1 - 1 = 0$, we can then conclude that there is no unit root or the series is stationary.

The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) takes trend or level stationarity as the null hypothesis unlike the ADF and PP tests, each of which takes the unit root as the null and involves testing the following system;

$$x_t = \omega_t + \omega_2 t + \zeta_t \qquad (3.14)$$

Where ζ_t is the random error; t is the time trend; *and* ω_t follows the random walk $\omega_t = \omega_{t-1} + \mu_t$. μ_t being the random error and having a variance σ_μ^2, the null hypothesis in KPSS is $\sigma_\mu^2 = 0$.As with other tests, we can drop the trend term if we want to test the non-stationarity of a non-trended variable.

As mentioned above, a stochastic trend may stationary by running a regression on the first difference of the variables. It is, however, important to note that differencing results in losing the information on the long run relationship between variables for first differences of variables are zero in the long run (Yuan and Kochhar, 1994). Co-integration analysis suggests a way out of this dilemma.

3.3.2. Cointegration Analysis

Co-integration refers to the situation where a linear combination of two or more individually non-stationary series can be a stationary series. The two widely used co-integration testing procedures are Engle-Granger's (1987) residual based two-step approach and the Johansen (1988) full-information maximum likelihood estimation technique.

In the Engle -Granger (EG) two step procedures, the first step is to run a cointegrating regression using OLS on the level forms of the variables of equation (3.1), the variables along their lags appearing as regressors, to obtain the residuals. This step involves collecting or retrieving the residual (υ_t) from equation (3.1) and then testing υ_t to identify the order of integration by usual stationarity tests. If υ_t is of a lesser order of integration than the individual variables of equation (3.1), then these variables are co-integrated; i.e. there exists long run relationship . In short, if the least squares estimation yields a stationary residual series for equation (3.1), then a cointegrating

relationship exists among these variables. Then, according to the Granger representation theorem, there exists an error-correction representation that the short-run adjustment mechanism could be obtained in the second step. It involves the reformulation of the model in first differences to produce a term representing the extent of the current "error" in achieving long-run equilibrium (Gujarati, 2004).

If the first step of the Engle-Granger cointegrating vector estimation proves that the variables are cointegrated, the OLS estimate of the cointegrating vector provides a "super consistent" estimator of the true vector in the sense that the estimators converge to the true parameters at a much faster rate than in the case of standard econometric estimators (Stock and Watson, 1988). Yet, the Engle-Granger procedure to estimate a Cointegration relationship in a n-variate case does not clarify whether the estimated cointegrating vector is a unique one or is simply a linear combination of the potential $(n-1)$ cointegrating vectors. It also needs priori information that the dependent variables are endogenous and the independent variables are weakly exogenous and it is a must to identify each endogenous and weakly exogenous variable in order not to lose information about the co-integrating relationships (Harris, 1995). Johansen's (1988) full-information maximum likelihood estimating technique overcomes these drawbacks of EG's two-step method.

Johansen (1988) and Johansen and Juselius (1990) have shown how to calculate a maximum likelihood estimator for parameters in multivariate models. Johansen (1988) approach is superior to the Engle-Granger two-step approaches for following reasons. The Engle-Granger approach estimation of long run equilibrium relation requires regressing one variable on rest of the variables. However, in practice, we find that one regression equation shows existence of Cointegration while reversing the order of the variables alters the result altogether and shows no cointegration. This is an undesirable feature of cointegration procedure as presence or absence of cointegration should be independent of the order of the variables presented on the left hand side or the right hand side of the equation (Dash, 2005). Opposed to this, Johansen's method does not rely on any arbitrary normalization. The other drawback of Engle-Granger approach is that it relies on two-step estimator. The first step is to generate error series and second step is to estimate a regression for this series in order to see if the series is stationary or not. Hence, any

error introduced in first step is carried onto the second step. More importantly, Johansen's procedure allows for testing certain restrictions put on the variables by the economic theory such as sign and size of the elasticity estimates (Sultan, 2011).

Technically, Johansen's procedure starts by defining a general polynomial distributed k-lag model of a vector of variables (Hall, 1989).Following Yuan and Kochhar (1994), consider for simplicity unrestricted 5 dimensional k- lags vector autoregression (VAR):

$$Z_t = \varphi + \psi_1 Z_{t-1} + \psi_2 Z_{t-2} \dots \psi_k Z_{t-k} + V_t \qquad (3.15)$$

Where, Z is a vector of our variables, i.e. $Z = [M\ Y\ P\ R\ ER]'$ And V_t is independently identically distributed (i.i.d) 5-dimentional vector $(V_1, \dots, V_5)$ with mean zero and vector of variance Σ.

Reformulating the above model, we can obtain the following vector error-correction model (VECM):

$$\Delta Z_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-1} + \Pi Z_{t-k} + V_t \qquad (3.15a)$$

Where $\Gamma_i = -I + \psi_1 + \cdots \psi_i$ and shows the short run speed of adjustment

$\Pi = -(I - \psi_1 - \cdots - \psi_k)$,

ΔZ_t is assumed to be an I (0) vector;

I is a 5 by 5 identity matrix and

Π is a 5 by 5 stochastic matrix that contains information on long run relationships.

In the long run, $\Delta Z_t = \mathbf{0}$, thus the equation $\Pi Z = 0$ contains information about the long run relationships between the model variables. Hence, the number of cointegrating vectors (r) is given by the rank of Π. If the rank of Π is zero, then the variables in Z_t are not cointegrated. But, if Π is full rank matrix, its rank being equal to its number of rows or columns, then the variables *in* Z_t are stationary at level (Harris, 1995). In general, if Z is I (d) variable, then the number of cointegrating vectors (r) is at most $N - 1, i.e. r \leq N - 1$. Assuming that there are r cointegrating vectors among variables, where $0 < r < 5$, Johansen shows that the matrix Π can be decomposed into two 4 by r matrices, say α and β, such that $\Pi = \alpha\beta'$, where α represents the

vector of speeds of adjustment to disequilibrium or is a matrix of the weights with which the vectors enter the equations in the system and β is a matrix of the parameters of the cointegrating vectors.

Assuming that the hypothesis about cointegration between the variables in the VAR is correct, in the long run, $\Pi Z_t = \alpha\beta' Z_t = 0$ implying that $\beta' Z_t$ is stationary though Z_t is non-stationary. Hence, $\beta' Z_t$ constitutes a set of r error correction mechanisms separating out the long-run and short-run responses in our model provided that the hypothesis concerning cointegration holds.

Johansen and Juselius (1990) present two likelihood ratios for testing the hypothesis that there are at most r cointegrating relationships among variables of a multivariate model. One test is based on the maximal eigenvalue[2] of the stochastic matrix II to test the null hypothesis that the number of cointegrating vectors is less than or equal to r against the alternative of $r+1$ cointegrating vectors and is based on the following test statistic

$$\lambda_{-max}(r) = -Tlog(1 - \hat{\lambda}_{r+1}) \qquad (3.15b)$$

Where $r = o, 1,2, \dots, n-2, n-1$; T is the number of observations and $\hat{\lambda}_s$ are the eigenvalues obtained from the estimated II matrix.

The other test is based on the trace of the stochastic matrix and tests the null hypothesis against the alternative that there are at least $r+1$ cointegrating vectors and is based on the test statistic

$$\lambda_{-trace}(r) = -T \sum_{l=r+1}^{n} log(1 - \hat{\lambda}_l), r = 0,1,2, \dots, n-2, n-1 \qquad (3.15c)$$

---

[2] Let B be an **n** by **n** matrix. If we let $|B|$ to the absolute value of the determinant of B and I to be an identity matrix, then the eigenvalues of B are the solutions to the equation $|\lambda I - B| = o$

3.3.3. Granger Causality Test

Granger (1969) introduced the concept of causality in which a variable y is said to be Granger caused by another variable, say x, if the current values of y can be predicted with better accuracy by using past values of x. He argued that there must be causality among these variables at least in one direction if there is a co-integrating vector between them. It is worthwhile mentioning that Granger's concept of causality is not about an "event-outcome" relationship, but is about predictability, which means that x has significant incremental predictive power in the evolution of y.

Granger (1986) and Engle and Granger (1987) supply a test of causality, which takes into account the information provided by the co-integrated properties of variables, and involves estimating the following VAR in this particular study:

$$\Delta M_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\,\Delta M_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta Y_{t-i} + \sum_{i=1}^{n} \alpha_{3i}\,\Delta P_{t-i} + \sum_{i=1}^{n} \alpha_{4i}\,\Delta R_{t-i} + \sum_{i=1}^{n} \alpha_{5i}\,\Delta ER_{t-i} + \alpha_6 ECT_{1t-1} + \epsilon_{1t} \quad (3.16a)$$

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i}\,\Delta M_{t-i} + \sum_{i=1}^{q} \beta_{2i}\Delta Y_{t-i} + \sum_{i=1}^{q} \beta_{3i}\,\Delta P_{t-i} + \sum_{i=1}^{q} \beta_{4i}\,\Delta R_{t-i} + \sum_{i=1}^{q} \beta_{5i}\,\Delta ER_{t-i} + \beta_6 ECT_{2t-1} + \epsilon_{2t} \quad (3.16b)$$

$$\Delta P_t = \theta_0 + \sum_{i=1}^{w} \theta_{1i}\,\Delta M_{t-i} + \sum_{i=1}^{w} \theta_{2i}\Delta Y_{t-i} + \sum_{i=1}^{w} \theta_{3i}\,\Delta P_{t-i} + \sum_{i=1}^{w} \theta_{4i}\,\Delta R_{t-i} + \sum_{i=1}^{w} \theta_{5i}\,\Delta ER_{t-i} + \theta_6 ECT_{3t-1} + \epsilon_{3t} \quad (3.16c)$$

$$\Delta R_t = \gamma_0 + \sum_{i=1}^{g} \gamma_{1i}\,\Delta M_{t-i} + \sum_{i=1}^{g} \gamma_{2i}\Delta Y_{t-i} + \sum_{i=1}^{g} \gamma_{3i}\,\Delta P_{t-i} + \sum_{i=1}^{g} \gamma_{4i}\,\Delta R_{t-i} + \sum_{i=1}^{g} \gamma_{5i}\,\Delta ER_{t-i} + \alpha_6 ECT_{4t-1} + \epsilon_{4t} \quad (3.16d)$$

$$\Delta ER_t = \rho_0 + \sum_{i=1}^{k} \rho_{1i}\,\Delta M_{t-i} + \sum_{i=1}^{k} \rho_{2i}\Delta Y_{t-i} + \sum_{i=1}^{k} \rho_{3i}\,\Delta P_{t-i} + \sum_{i=1}^{k} \rho_{4i}\,\Delta R_{t-i} + \sum_{i=1}^{k} \rho_{4i}\,\Delta ER_{t-i} + \alpha_6 ECT_{5t-1} + \epsilon_{5t} \quad (3.16e)$$

Where all variables are in logarithms, Δ the first is difference operator; $g, k, n\ q,$ and w are the optimal lags to be selected with objective information criteria and ECT is the error correction term that captures the causality of cointegrated variables.

To see only whether imports are granger caused by other variables of the model, the first equation of system (3.16) will be estimated. In that case, the first null hypothesis would be that the coefficients of lagged Y are zeros, which implies that real income does not Granger cause imports. The following steps are involved in testing this null hypothesis. First, the current value of imports would be regressed on lags of P, R and ER but not on Y and the residual series will be obtained. Second, the residual series from the first step will be regressed on the entire set of explanatory variables and the coefficient of determination R^2 will be obtained; and finally, a Lagrange multiplier test in F distribution (LMF) will be formulated. The causality from and to imports, domestic price level, exchange rate (ER) and foreign exchange reserves(R) would be tested in a similar manner.

3.3.4. Stability Tests

The stability of import demand function is very important for the effectiveness of trade policy (Yuan and Kochhar, 1994; Rehman, 2007; Yue, 2010). In stability test, we see whether the estimated import demand function has shifted or not over the time period included in the sample of the study. One of the first tests on structural change with unknown break point was the Standard CUSUM test which was introduced by Brown, Durbin and Evans in 1975. The CUSMUS of Squares (CUSMUSQ) test is another test which is derived from CUSUM test. Both tests are based on the cumulative sum of the recursive residuals ($\varepsilon_j's$).

Under the null hypothesis of parameter stability, the two tests will have distributions defined as:

$$CUSUM: W_r = \frac{1}{s}\sum_{j=k+1}^{r} \varepsilon_j \ , where\ s^2 = \frac{1}{n-k}\sum_{j=k+1}^{n} \varepsilon^2{}_j = \frac{1}{n-k}\sum_{j=1}^{n} \hat{\varepsilon}^2{}_j \qquad (17a)$$

$$CUSUMSQ: S_r = \sum_{j=k+1}^{r} \varepsilon^2{}_j \div \sum_{j=k+1}^{n} \varepsilon^2{}_j = \sum_{j=1}^{n} \varepsilon^2{}_j \div (n-k)s^2 \qquad (17b)$$

It is important to note that these test statistics are advantageous for they can be graphed and can identify not only their significance but also at what time point a possible break occurred. Hence, we will apply CUSUM and CUSUM of Squares Tests and Recursive coefficients to check the stability of the import demand function; and would conclude that the import demand model is stable and is correctly specified provided that neither the CUSMUS nor the CUSMUS of Squares (CUSMUSQ) test statistics exceed the bounds of the 5 per cent level of significances.

3.3.5. Impulse Response Functions and Variance Decompositions

A VAR analyses represents system dynamics and innovation accounting as a result of which it often centers on the calculation of impulse response functions (IRFs) and error variance decompositions so as to track the evolution of economic shocks through the system (Pesaran and Shin, 1997).

An impulse response function measures the time profile of the effect of shocks at a given point in time on the (expected) future values of variables in a dynamical system. The best way to describe an impulse response is to view it as the outcome of a conceptual experiment in which the time profile of the effect of a hypothetical $m\ by\ 1$ vector of shocks of size $\delta = (\delta_1, \dots, \delta_m)'$,say, hitting the economy at time t, is compared with a base-line profile at time $t + n$. In short, the Impulse Response Function analysis is used in dynamic models such as a VAR to describe the impact of an exogenous shock or innovation in one variable on the other variables of the system (Pesaran, 1997).

If the innovations to the covariance matrix of the residuals (Σ_ε) in a VAR model are diagonal or are contemporaneously uncorrelated, then the interpretation of the impulse response is that the i^{th} innovation of the residuals at time t is simply a shock to the i^{th} endogenous variable in the system. In practice, however, it turns out innovations are not diagonal and thus, the analysis of the evolution of the system caused just by an innovation in one variable may not be appropriate since it has innovation has a possibility of occurring along with another innovation. The solution to this problem is to orthogonalize the covariance matrix of residuals (Σ_ε) with the result that the evolution of shocks through the system will be uni-directional (Granger and Swanson, 1996).

Points on the IRFs could be made clear by looking at the equations specified in system (3.2).A shock to one variable in that system affects the variable itself and this affect is transmitted onto all of the endogenous variables in the system since VAR has a dynamic structure. For instance, a change in υ_{1t}will immediately have an effect on M_t and it will also change future values of Y_t, P_t, R_t and ER_t since there exist the current and lagged values of M_t in all of the five equations.

If the innovations (the error terms) are uncorrelated, then each error term is innovation for the corresponding endogenous variables in each equation. That is, υ_{1t} is innovation to M_t, $\upsilon_{2t}$is innovation for Y_t, υ_{3t} is innovation for P_t, υ_{4t} is innovation for R_t and υ_{5t} is innovation for ER_t. However, the covariance matrix of these innovations (Σ_ε) is usually correlated in real data that the variables in the VAR have a common component which cannot specifically be associated with one of them. It is possible to overcome this problem by attributing all of the effect of any common component to the variable that comes first in the VAR system. This methodology is named as Cholesky decomposition. The problem with this decomposition is that the result may change depending on the order of the variables in the VAR system. Thus; this property should be taken into account in any impulse response function analysis (Kilic, 2008).

It is can be noted from this sub-section that impulse response functions trace the effects of a shock to one endogenous variable onto the other variables of the VAR model while the variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. With this background, the current study employs both the IRFs and VDCs so as to decompose and get the relative effect of a shock on the endogenous variables of the specified VAR model.

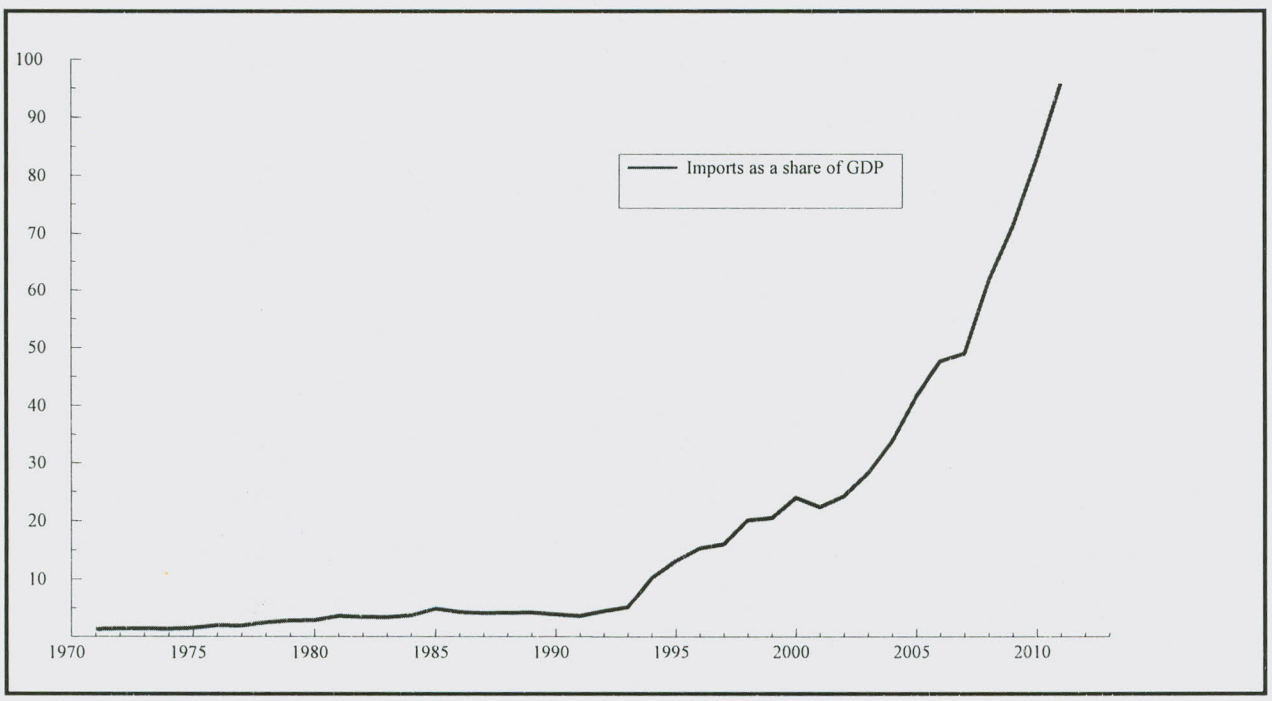
CHAPTER FOUR

DESCRIPTIVE ANALYSIS OF IMPORTS

This chapter is organized into five sections. The first two sections of the chapter give a simple descriptive analysis of the trends and the structures of Ethiopia's import. The third and the fourth sub-sections describe the impacts of real GDP, exchange rate, foreign exchange reserves and inflation rate on imports; and the last sub-section casts a light on the origin of the country's imports.

4.1. Trends of Imports

Imports of Ethiopia have generally been increasing since the late 1990s (see Figure 4.1 below).In particular, imports of goods and services as a share of GDP increased from 24% in 2000/01 to 33% in 2010/11(see Appendix II).This can mainly be attributed to the relative openness of the economy, the fast economic growth over the past decade and the relatively rising foreign exchange reserves of the county.



Source: Own computation using MoFED (2012) data

Figure 4.1: Imports as a Percentage of real GDP

4.2. Structure of Imports

Imports are chiefly classified into three groups on the basis of their use. These are capital, consumer and intermediate goods. The intermediate goods classification consists of raw materials, semi-finished goods and fuel. Other import items are labeled under miscellaneous import (ERCA, 2006).

Table 4.1: percentage share in total import value

Fiscal Year	Raw materials	Semi finished goods	Fuel	Capital goods	Consumer goods	others
1995/96	2.5	17.5	12.9	35.9	27.1	4.1
1996/97	2	19.2	18.4	38.8	20.6	0.9
1997/98	2	16.4	24.4	29.8	19.7	7.7
1998/99	1.7	16.8	11.4	33.7	28.1	8.3
1999/00	1.2	12.7	15.5	29.2	26.8	14.5
2000/01	1.5	18.3	18.8	28.6	30.1	2.8
2001/02	1.8	17	15.8	28.3	34.6	2.5
2002/03	1.2	14.8	15.5	29.6	35.2	3.7
2003/04	1.3	18.1	12.2	31.6	35.1	1.5
2004/05	1.4	18.3	18.4	33.0	27.1	1.8
2005/06	1.7	17.9	18.7	31.6	27.9	2.1
2007/08	3.8	18.5	23.8	28.0	22.5	3.4
2008/09	4.6	14.8	16.3	32.0	30.3	2.03
2009/10	2.6	14.8	15.9	34.9	30.4	1.4
2010/11	2.2	14.9	20.1	33.4	27.8	1.9

Source: EEA and NBE Annual reports (2005/06-2010/11)

Imports of merchandise goods of the country grew by about 24% between 2000/01 and 2010/11(see Table 4.1 above).The three major components of import items accounted, on average, for 82% of the total imports during this period. The share of imported capital goods in total value

of imports has been increasing since 1995/96. It has, for instance, increased from 29% in 1999/00 to 34% in 2010/11. Imports of consumer goods have taken a larger share of the import bill, accounting for 31% of the import bill between 2000/01 and 2003/04. From 2004/05 onwards, however, the share of capital goods has been greater that than of consumer goods.

4.3. Average growth rates of real GDP, Imports and Inflation

The growth of imports is highly correlated with the growth rates of GDP and CPI (See Table 4.2 and Figure 4.2 below).The average growth rate of real GDP in the period from 1974/75-1991/92 was only 1.9 percent. The average real growth rate of payments on import in the same period stood at about 4 percent while real inflation grew approximately by 11 percent. The low growth rate of GDP in this period is attributed to the excessive government intervention and centrally planned management of the then regime while the relatively high rate of inflation is due to the rise in world fertilizer and food price indexes (Sewasew, 2002). In support of this, Fried and Schultz (1975) argued that the oil price hike, coupled with the rise in the world fertilizer and food price indexes, had an adverse effect on the economies of many developing countries between 1973/74 to 1974/75.

Table 4.2: Average growth rates of Real GDP, real imports and CPI

Variable	Period		
	1973/74-1990/91	1991/92-2002/03	2003/04-2009/10
Real GDP	1.947	3.537	11.375
Import	3.806	19.92	14.088
Inflation	7.583	5.79	16.63

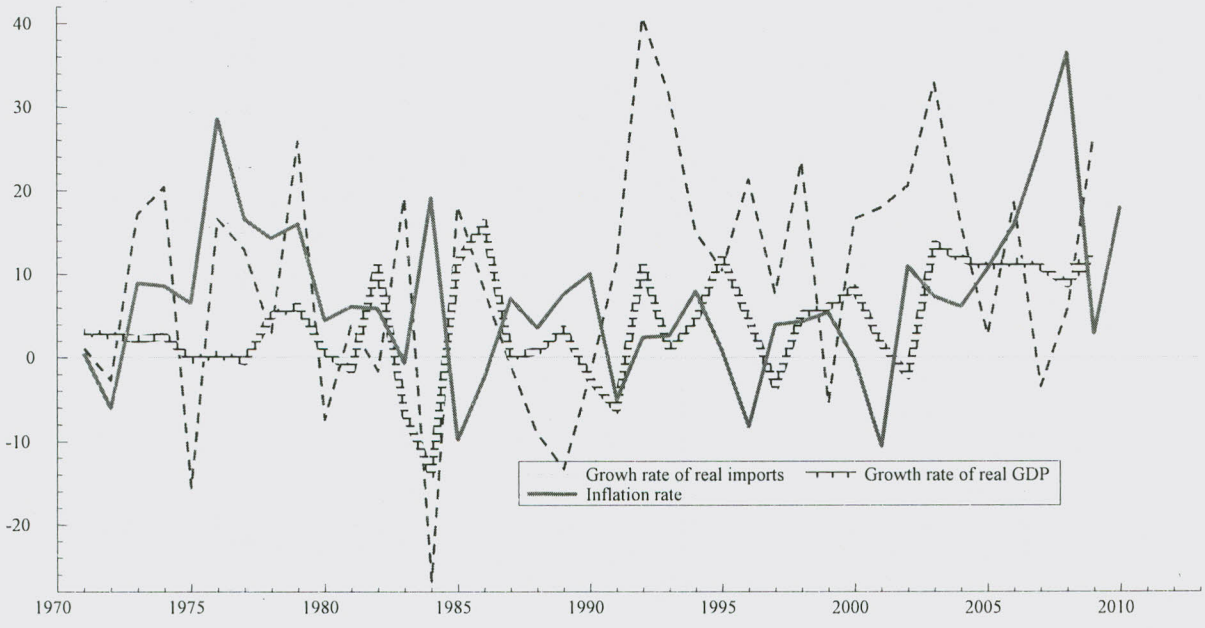
Source: Own computation from MoFED (2012), NBE (2011) and EEA (2011) databases

In the first oil price hike in 1973/74, the world oil price increased from 4.3 U.S. dollar per barrel in 1973 to 11 U.S. dollar per barrel[3]. Following the oil shock, the price of imported goods increased that important imports for economic growth declined, thereby causing a fall in the growth rate of real GDP between 1973/74 to 1974/75 (see Appendix II).

[3] Ethiopian Petroleum Enterprise

Fortunately, the oil price shock was short-lived, and was followed by the rise in coffee price in 1976/77(NBE, 1998). This resulted in an increase in real GDP growth rate from 2.3 percent in 1974/75 to 2.59 percent in 1975/76 and in a rise of real import growth rate negative 11.34 to 15.34 percent in the same period. Desperately, the coffee price boom was also momentary for it was followed by the second oil shock of 1979/80, which lasted until late 1983/1984. In 1980/81, both real import and GDP declined from the previous period.

In 1982/83, the growth rate of the value of real import increased to 6.28 percent from -10.86 percent as a result of the purchase of two airplanes by Ethiopian Air lines (IMF, 1987).This was immediately accompanied by the severe drought in 1984/85 that caused a decline in the growth rates of both real GDP and import to -6.69 and 5.38 percent from their previous year values of 11 and 6.29 percents respectively.



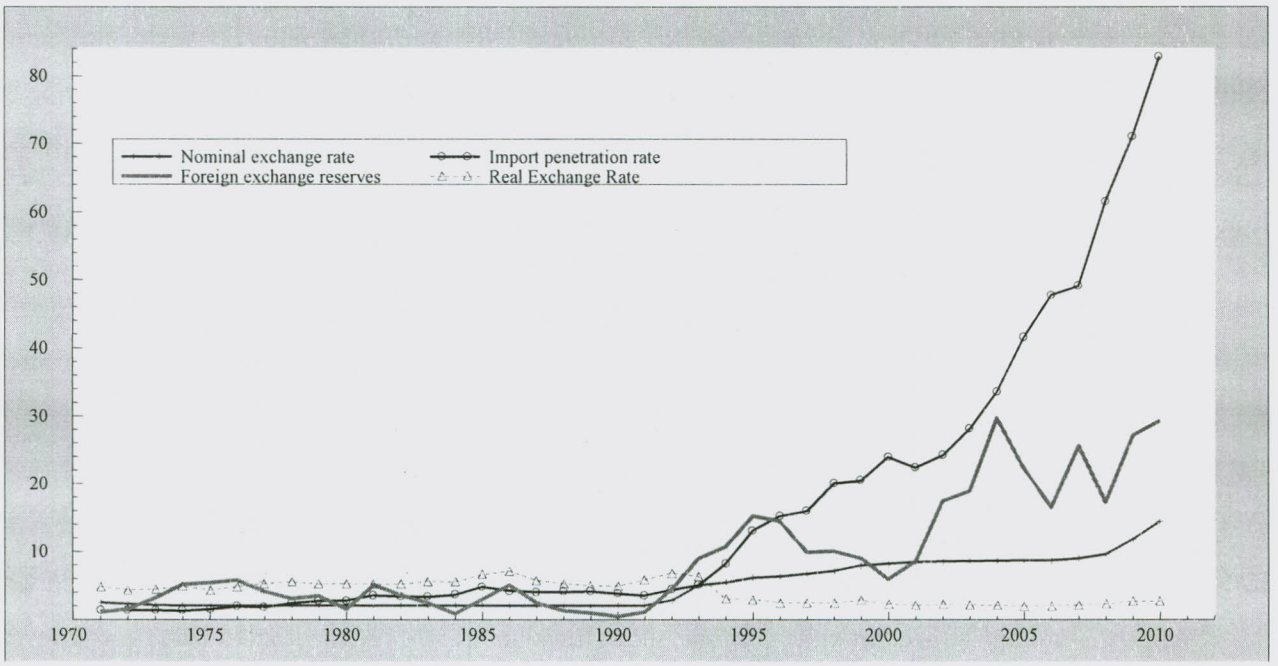
Source:Own computation using EEA(2012) and MoFED (2012) databases

Figure 4.2: Growth rates of real GDP, Imports and CPI

The period 1991/92 heralded a transitional free market economy with presumption of transforming the country from a highly centralized command to a liberalized economy. From the period of transition to the drought period of 2002/2003, the average annual growth rates of real income and import were 3.53 and 19.93 percent. The figure rose to 11 percent for real GDP while it has fallen for import during the period from 2003/04 to 2010.

4.4. Imports, REER and Foreign Exchange Reserves

Movements in the exchange rates are positively correlated with the growth in real imports at least theoretically (Rogers,2000).This means that a rise in exchange rate or an appreciation of a currency of a nation would lower the cost of imports, under the ceteris paribus assumption, thereby leading to a rise in the real imports demanded. Conversely, a fall or depreciation of the exchange rate will be reflected in a higher cost for imports leading to a decline in the volume of imports demanded. On the basis of this argument and so as to promote exports, the government of Ethiopia has been devaluating its currency since 1992 along with other liberalization measures.



Source:Own computation using MoFED(2012) and EEA(2012) databases

Figure 4.3: Trends in exchange rates, FOREX reserves and Imports

The imports of the country keept on increasing despite the devaluation measures taken by the government since 1992 (see Figure 4.3). In the year 1992 alone, the nominal exchange rate was devalued by about 141.5 percent,from 2.07 birr per US dollar to 5 birr per US dollar. In summer 2010,NBE devalued Birr by about 17 percent against US dollar with a view of improving the balance of Payments of the nation. Given that over 30% of the country's imports are capital goods and exports are supply constrained ,the action of NBE falled short of its intended goal and added a fuel to the then inflationary pressure by making imports more expensive (EEA,2011). This ineffectiveness of NBE's action could be explained with the argument of Ghei and Pritchett (1999) that devaluation may not increase the supply of import substitutes and export in a developing country where trade is liberalized at the time of devaluation, but may increase the supply of import substitutes where trade is not liberalized at the time of devaluation. The authors argued further that most imports of developing countries are inputs into the production process that the elasticity of substitution in production between imports and domestic value added is essentially zero.

A positive correlation is expected between foreign exchange reserves of a country and its demand for imports for the desired level of import could not be actualized in the absence of sufficient level of FOREX reserves. Figure 4.3 supports this fact that the rise in the import penetration rate (imports as a share of GDP) of Ethiopia is closely related with the fluctuations in the foreign exchange rate. In support to this, Sultan (2011) argued that foreign exchange is the only medium of exchange in the international market and acts as a constraint for developing countries to import necessary inputs for the domestic production process.

Another fact depicted in Figure 4.3 is the nation's outward orientation. That is, the import penetration rate of the country has exhibiting a rising trend, the import penetration rate standing at about 80 percent in 2010 as compared to the less than 10 percent two decades ago.

4.5. Origin of Ethiopia's Imports

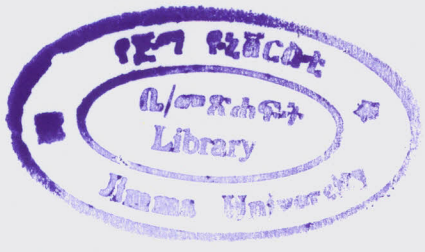
With an outward orientation, Ethiopia imports from both the economically developing and the developed trade partners. In the year 1984/85, the highest imports of the country came from Europe with a total share of 37.2%). Russia (18.3%), the Far East (8.8%), the Middle East (0.9%) and Africa took the remaining positions. The rank being the same, the share of Europe, Russia and the

Far East (Japan and China) fall to 35.1 %, 8.4 and 7.7% respectively in 1990/91 while the share of the Middle East and Africa rose to 3.7% (See appendix II).

On the basis of the Ethiopian Customs Authority data, the Ministry of Trade and Industry computations declared that the Middle East and Asia were the most important sources of Ethiopia's import in 2004/05.The share of these regions rose to 57.5% with a remarkable rise from their 15% share in 2000/01. With a slight rise in its share from 23.1% to 25.5%, Europe took second rank over the same period while remaining two third and fourth places were taken by North America (6.2%) and Africa (1.6%)[4].

Asia (China, Japan and India) and the Middle East(Saudi Arabia and The United Arab Emirate) took the first consecutive positions with a share of 30.1% and 17.7% respectively while the share of Europe, Africa and Russia fall respectively to 9.9%, 1.6% and 1% in 2009/10.As for the individual trading partners, the share of Saudi Arabia increased from its 8.4 % share of 2003/04 to 12.7 % in 2009/10 while that of China rose from 10.3 % as o 17.5% over the same period (see Appendix II). The rise in china's share is basically attributed to the recent episode that the country has become a major source of lower cost consumer goods and other basic manufactured items. As Ethiopia's dependence on petroleum and related products has increased as of recently, it is also valid that the share of Saudi Arabia has increased over the period. In short, Saudi Arabia and China are now the two major origins of Ethiopian imports.

To sum up, the simple descriptive analysis shows that the imports of the country have been increasing over the past two decades. This is mainly attributed to the positive effects of the rise in the domestic income level and foreign exchange reserves; and to the insignificant effects of inflation and devaluation. The next chapter systematically supplements these simple descriptive findings with an econometric analysis.



[4] See the 2007 Trade Promotion Manual for Ethiopian Diplomatic Missions

CHAPTER FIVE

ESTIMATION AND DISCUSSION OF RESULTS

On the basis of the methodology described in chapter three, this chapter explores first the time series characteristics of the data using unit root tests. Then, Johansen's cointegration test is conducted so as to establish a long run relationship among the variables. Thirdly, a Granger causality test is employed to analyze the causality from exchange rate, real GDP, inflation and exchange rate to imports. Following is the estimation of the dynamic short run import equation. Fifthly, stability tests are formulated for both the VAR and the vector error correction models; and variance decomposition and impulse response analysis are also carried out to supplement the findings. Finally, the predictive power of the partial adjustment import demand model is compared with that of the Johansen's model.

5.1. Unit Root Testing

Augmented Dickey-Fuller (ADF), Philips-Perron (PP) and KPSS Unit Root tests are employed to find out the time series characteristics of the data. While the first two tests allow for three options of tests outputs; namely with intercept (C) only, with both intercept and trend (T), and without intercept and trend, the KPSS test does not allow for the third option. The null hypothesis for the ADP and the PP tests claim that the underlying series has a unit root or is not stationary against the alternative hypothesis that the series is stationary where as the null hypothesis of the KPSS test claims that the underlying series is stationary.

The ADF, adjusted for lag length using Akaike information criterion (AIC), and the PP[5] class of tests show that the log of imports (lnM) has a unit root in levels for without constant and trend, with constant only and with constant and trend specifications since the null hypothesis of unit root cannot be rejected either at the 1% or the 5% levels of significance. This being the case, however, the KPSS statistic accepts the null hypothesis of stationarity at the one percent level of error margin (see Table 5.1).

[5] The results for PP unit root test are given in Appendix I

Table 5.1: Augmented Dickey-Fuller (ADF) and KPSS Unit Root Test Results

Variable	Specification	ADF unit root test				KPSS Unit root test			Order of Integration
		Lag	ADF test statistic	1% critical value	5% critical value	BW	KPSS test statistic	1% critical value	
lnP	without C&T	**2**	0.8962	-2.6289	-1.195				I(1)
	With C	7	-2.3926	-3.6537	-2.957	5	0.7174	0.7390	
	With C&T	2	-1.3246	-4.2268	-3.537	0	0.1729	0.2160	
ΔlnP	with C	1	-3.0446	-3.6210	-2.943	3	0.2970	0.7390	I(0)
	With C and T	1	-3.0177	-4.226	-3.536	3	0.1037	0.2160	
	Without C&T	1	-2.8646	-2.6289	-1.950				
lnY	With C	2	4.0623	-3.6210	-2.943	5	0.7258	0.7390	I(1)
	With C and T	2	1.4522	-4.2268	-3.536	5	0.1947	0.2160	
	without C&T	0	4.0949	-2.6256	-1.949				
ΔlnY	With drift (C)	2	-2.0409	-3.6267	-2.945	3	0.6400	0.7390	I(0)
	With C and T	1	-6.6140	-4.2268	-3.536	6	0.1590	0.2160	
	Without C&T	2	-1.0806	-2.6307	-1.950				
lnM	With C	0	1.7721	-3.610	-2.938	5	0.7638	0.7390	I(1)
	With C &T	0	-0.6070	-4.2118	-3.529	5	0.1710	0.21600	
	Without C&T	0	5.146	-2.6256	-1.949				
ΔlnM	With C	1	-3.3870	-3.6210	-2.943	2	0.3948	0.73900	I(0)
	With C &T	0	-6.6040	-4.2191	-3.533	1	0.0800	0.21600	
	Without C&T	1	-1.7844	-2.6289	-1.950				
lnER	With C	0	-0.7654	-3.6104	-2.938	5	0.5808	0.73900	I(1)
	With C & T	0	-2.2238	-4.2118	-3.539	4	0.1489	0.21600	
	Without C&T	0	-0.8053	-2.6256	-1.949				
ΔlnER	With drift	0	-5.3749	-3.6155	-2.941	7	0.1791	0.73900	I(0)
	With C & T	0	-5.3635	-4.2191	-3.533	8	0.1076	0.21600	
	Without C&T	0	-5.3708	-2.6272	-1.938				
lnR	With C	0	-1.6958	-3.6104	-2.938	4	0.6320	0.73900	I(1)
	With C & T	0	-2.4042	-4.2118	-3.529	4	0.1333	0.21600	
	Without C&T	0	0.5534	-2.6256	-1.949				
ΔlnR	With C	0	-5.6588	-3.6155	-2.941	7	0.0968	0.73900	I(0)
	With C & T	0	-5.5823	-4.219	-3.533	5	0.0959	0.2160	
	Without C&T	**0**	**-5.6494**	**-2.6272**	**-1.949**				

All the three tests confirm that the first difference of lnM is stationarity at the 1% and 5% levels of significance. This happens with a constant only; and with a constant and trend specifications for ADF and KPSS tests; and with all the three specifications for the PP test. By the same token, at least two of these tests at a time reveal that lnY, lnP, lnR, and lnER are all non-stationary at their levels, but stationary when differenced once for the null hypothesis of unit root is rejected at the 1% or 5% level of significance. In short, the unit roots tests provided information that the variables are stationary at their first differences or are integrated of order one, I (1).

Johansen multivariate cointegration tests requires that each variable must be integrated of the same order (Sinha, 1997).The fact that the variables of the model are integrated of order one, I (1), helps in the determination of cointegrating relationships for it does not suffer from mixed order of integration; and hence, Johansen's cointegration analysis can be used to carry out the estimation of the specified import model.

5.2. Optimal Lag Length and VAR Analysis

Once the order of integration is determined, the next step in estimation of the long run relationship using Johansen's cointegration estimation technique is to determine the optimal lag length that gives white noise residuals for the Johansen technique is based on the assumption of white noise errors (Rao, 1994).Setting an optimal lag-length is desirable for there can be variables that may affect only the short run behavior of the model which, if omitted, may become part of the error term which leads to a residual misspecification problem (Harris, 1995).

Table 5.2: Model reduction test for the Import Equation

Progress to date

Model	T	p		log-likelihood	SC	HQ	AIC
SYS(4)	36	30	OLS	135.49880	-4.5414	-5.4005	-5.8610
SYS(3)	36	55	OLS	164.39912	-3.6585	-5.2333	-6.0777
SYS(2)	36	80	OLS	199.92301	-3.1435	-5.4342	-6.6624
SYS(1)	36	105	OLS	241.41912	-2.9602	-5.9668	-7.5788

Tests of model reduction (please ensure models are nested for test validity)
SYS(3) --> SYS(4): F(25,79) = 1.7196 [0.0367]*
SYS(2) --> SYS(4): F(50,76) = 1.8197 [0.0090]**
SYS(1) --> SYS(4): F(75,56) = 1.8332 [0.0093]**

*and** indicates the rejection of a null hypothesis at 5% and 1 error margins respectively

According to Liew(2000), the optimal lag length for a model can be selected using Schwarz information criterion (SIC), Hannan-Quinn criterion (HQC), Final prediction error (FPE) and Bayesian information criterion (BIC).In cases of small sample (60 observations and below), Liew(2004) showed that AIC and the final prediction error (FPE) are superior to other tests and hence, the Akaike Information Criterion (AIC) is used to determine the optimal lag length for the specified VAR model.

The VAR estimates were successively run from lag length four to lag one and the results are reported in Table 5.2. The Akaike Information Criterion (AIC) predicts that the VAR estimate with the lowest AIC (in absolute value) is the most efficient one. Accordingly, the first lag is found to be optimal for the specified import demand equation. The model reduction test confirms that AIC correctly estimated the optimal lag length to be one for the VAR analysis since the null hypothesis of model reduction from VAR (2) to VAR (1) or from SYS (3) --> SYS (4) is rejected by the overall F-test at 5% level of significance.

Having determined the optimal lag length to be 1, the VAR model to be estimated would be;

$$lnM_t = \alpha_0 + \alpha_1 lnM_{t-1} + \sum_{i=0}^{1} \alpha_2\, lnY_{t-1} + \sum_{i=0}^{1} \alpha_3\, lnP_{t-1} + \sum_{i=0}^{1} \alpha_4\, lnR_{t-1} + \sum_{i=0}^{1} \alpha_5\, lnER_{t-1} + \upsilon_{1t}$$

$$lnY_t = \beta_0 + \beta_1 lnY_{t-1} + \sum_{i=0}^{1} \beta_2\, lnM_{t-1} + \sum_{i=0}^{1} \beta_3\, lnP_{t-1} + \sum_{i=0}^{1} \beta_4\, lnR_{t-1} + \sum_{i=0}^{1} \beta_5\, lnER_{t-1} + \upsilon_{2t}$$

$$lnP_t = \theta_0 + \theta_1 lnP_{t-1} + \sum_{i=0}^{1} \theta_2\, lnY_{t-1} + \sum_{i=0}^{1} \theta_3\, lnP_{t-1} + \sum_{i=0}^{1} \theta_4\, lnR_{t-1} + \sum_{i=0}^{1} \theta_5\, lnER_{t-1} + \upsilon_{3t}$$

$$lnR_t = \gamma_0 + \gamma_1 lnR_{t-1} + \sum_{i=0}^{1} \gamma_2\, lnY_{t-1} + \sum_{i=0}^{1} \gamma_3\, lnP_{t-1} + \sum_{i=0}^{1} \gamma_4\, lnR_{t-1} + \sum_{i=0}^{1} \gamma_5\, lnER_{t-1} + \upsilon_{4t}$$

$$lnER_t = \vartheta_0 + \vartheta_1 lnER_{t-1} + \sum_{i=0}^{1} \vartheta_2\, lnY_{t-1} + \sum_{i=0}^{1} \vartheta_3\, lnP_{t-1} + \sum_{i=0}^{1} \vartheta_4\, lnR_{t-1} + \sum_{i=0}^{1} \vartheta_5\, lnER_{t-1} + \upsilon_{5t}$$

5.3. Estimated Cointegrating Relationships

The number of cointegrating vectors for imports, real output, foreign exchange reserves, exchange rate and domestic price level is tested using a maximal eigen-value and trace LR tests; and the test results are reported in Table 5.3.

The trace test, reported in Table 5.3(a), shows that the null hypothesis of no conintegrationg vector(r=0) is rejected at the 1% level of significance since the trace test statistic (103.3230) is greater than the 5 percent critical value. But, the null hypothesis that there is at most one cointegrating vector ($r \leq 1$) between the variables of the model could not be rejected. Hence, the trace test predicts one cointegrating vector.

Table 5.3: Johansen Maximum Likelihood ratios test result

a) Tests based on trace of the stochastic matrix

Null hypothesis[H_0]	Alternative Hypothesis: H_1	Eigenvalue	Trace Statistic	95%Critical Value	Probability
r=0	r≥1	0.658758	103.3230	88.80380	0.0030**
r≤1	r≥2	0.476894	62.46682	63.87610	0.0653
r≤2	r≥3	0.397240	37.84392	42.91525	0.1467
r≤3	r≥4	0.242048	18.60693	25.87211	0.3046
r ≤ 4	r≥5	0.191457	8.075812	12.51798	0.2455

b) Tests based on maximal eigenvalue of the stochastic matrix

Null hypothesis[H_0]	Alternative Hypothesis[H_1]	**Eigenvalue**	**Test statistic**	**95%Critical Value**	**Probability**
r=0	r=1	0.658758	40.85616	38.33101	0.0251*
r≤1	r=2	0.476894	24.62290	32.11832	0.3089
r≤2	r=3	0.397240	19.23699	25.82321	0.2896
r≤3	r=4	0.242048	10.53112	19.38704	0.5623
r≤4	r=5	0.191457	8.075812	12.51798	0.2455

Similarly, the maximal eigenvalue/likelihood test, reported in table 5.3(b), shows that the null hypothesis of no cointegrating vector (r=0) is rejected at the 5 percent level of significance and is in favor of the alternative hypothesis that there is one cointegrating vector(r=1).Similar to the first test, the null hypothesis that there is one cointegrating vectorts between the variables cannot be rejected at the conventional levels of significance. Hence, both tests supplement each other that there is only one cointegrating vector among the variables of the model. This means that

there is only one long run relationship between real imports, real income, foreign exchange reserves, domestic price level and exchange rate for the sample period being covered in the study. This in turn means that there is a single equation that ties only one endogenous variable to other exogenous variables of the model.

Table 5.4: Estimated Eigenvalues, Eigenvectors and Weight of the stochastic Matrix

a) Standard β' Eigenvectors

lnMt	lnYt	lnPt	lnRt	lnERt
1.0000	-1.5228	-0.17359	-0.27259	0.17542
-0.8183	1.0000	0.05188	-0.27610	0.54435
1.1152	-2.6737	1.0000	-0.14934	-0.46288
0.2563	5.7708	1.1930	1.0000	-8.0281
-19.750	153.72	-32.240	-8.9013	1.0000

b) Standard α-coefficients or Matrix of Weights

lnMt	lnYt	lnPt	lnRt	lnERt
-0.46854	-0.07253	-0.066307	0.41900	-0.30596
0.00970	-0.10362	-0.11864	0.93996	0.068981
-0.05121	0.028945	-0.04616	-0.05937	0.033387
-0.02185	-0.00590	0.00884	-0.05013	0.003193
-0.00057	0.000157	0.00107	0.00473	0.000948

Once the cointegrating vector is established to be one, then the problem at hand is that the dependent variable is not known yet. It is possible to identify the endogenous variable of the model though the test of weak exogeneity that involves imposing a zero restriction on columns of the weight (α-coefficient) matrix.

The likelihood ratio (LR) general restrictions (the Chi-square statistics) test speaks that the null hypothesis of weak exogeneity is rejected only for the logs of Import value (lnM) while the rest of the variables are found to be statistically weakly endogenous (see Table 5.5). This means that lnY; lnP, lnER and lnR are exogenous to the system that it is logical to condition or express

import value on them. It can now be inferred that there is a single long run dynamic equation that links the real value of imports to those variables which wouldn't endogenously be determined from the model.

The existence of one cointegrating vector suggests that only the first row of β matrix and the first column of α matrix are important for further analysis. The first column of Table 5.4(b) shows the speed of adjustments towards or deviation from the long run steady state value of each variable of the model.

Table 5.5: Tests Results of Zero Restrictions on α –coefficients

Variable	α coefficient	LR test of general restrictions: Chi^2(1)	P value
LnMt	-0.4684	13.198	[0.0003]**
LnYt	0.00970	1.7711	[0.1832]
LnPt	-0.0512	0.5684	[0.4509]
lnRt	-0.0219	0.6859	[0.4076]
LnERt	-0.0057	1.199	[0.3243]

More specifically, the values -0.4684,-0.0512, -0.0219 and -0.0057 indicate the speed of adjustment of imports, domestic price level, foreign exchange reserves and exchange rate towards their long run steady state path, respectively while the positive coefficient of domestic income level indicate the extent to which this variable deviates from its long run steady state path following a certain shock. Put it another way, the log of real income (lnY) is currently above its steady state path and will start to fall while the rest of the variables are below their equilibrium value that they will start to rise so that all variables reach their steady state value in the long run.

Having found the dynamic single equation long run relationship between the variables of the model, the next step is to formulate a test of significance on the long run coefficients (β's) of the regressors. Thus, an exclusion test, where a zero restriction is imposed on the long run β coefficients, is used so as to locate the relevant or statistically significant variables of the cointegrating vector. The output of this test is obtained from PCGIVE and is reported in Table

5.6. As can be read from the table, domestic income and foreign exchange reserve are found to be significantly different from zero; and the null hypothesis that each variable is statistically insignificant is rejected at the conventional 1 percent level of significance. Allowing an error margin of 10 percent, domestic price level is also found to have a significant share in explaining the demand for import while the long run coefficient of exchange rate is found statistically not to be different from zero.

Table 5.6: Tests for Zero restrictions on β- coefficients

Variable	β coefficient	LR test of general restrictions: Chi^2(1)	P -value
lnY_t	-1.5228	11.157	[0.0008]**
lnP_t	-0.1736	2.807	[0.0939]
lnR_t	-0.2729	12.965	[0.0003]**
$lnER_t$	0.1754	1.435	[0.2309]

** indicates the rejection of the null hypothesis that a variable is individually insignificant

Since the model is specified and estimated in its log-linear form, the coefficients of the long run equation can be interpreted directly as elasticities. Before interpreting these coefficients, however, it is advisable to first conduct model diagnostic tests. Accordingly, various model diagnostic tests are run and the result is reported in Table 5.7 along the estimated coefficients of the long run model.

The system diagnostic tests, as reported in the lower block of table 5.7[6], confirm that the specified model is adequate in explaining the conjectured relationship. The variance inflating factor (VIF) of each vaiable is less than ten implying that there is no perfect multicollinearity between the explanatory variables of the model. There is also no indication of serial autocorrelation as shown by the Breusch Godfrey LM test for serial correlation. The nulls of homoscedastic and normally distributed error terms cannot be rejected at any conventional level of significance. The ARCH test indicates the absence of autoregressive conditional hetroscedastic errors. Ramsey's (1969) RESET test does not reject the null hypothesis of no functional misspecification of the estimated import

[6] See Appendix V for the full VAR diagnostic test result from PCGIVE

demand equation. Finally, the VAR parameter stability test is conducted with a plot of the 1st –step recursive residuals (1st-step residuals +/-2nd) (See Appendix VI);and the test result shows that the null hypothesis of overall VAR parameters' consistency cannot be rejected for recursive plots of variables oscillate around a zero mean line. This implies that the estimated long run model is stable that it could be used for a policy purpose.

The long run regression output shows that only the domestic income and the foreign exchange reserves have a significant positive effect on the nation's aggregate imports demand; and both variables carry their theoretically expected sign. The aggregate import demand is found to be income elastic that a one percent increase in real income of the nation leads to, on average, a 1.523 percent increase in the nation's demand for imports. This means that imports are the sources of growth in real GDP of the nation. This finding is similar to the findings of Mwega (1993) for Kenya; Yuan and Kochhar (1994) for China; Sinha (1997) for Thailand; Egwaikhide (1999) for Nigeria; Rehman (2007) for Pakistan; Sultan (2011) for India; Girma (1982), Solomon (2000) and Yohaness (2011) for Ethiopia. It, however, refutes the findings of Muluneh (1982) and Alem (1995), each of which found a significant negative relationship between GDP and imports for Ethiopia.

Table 5.7: Estimated long-run elasticities of Import demand model

	Domestic output level	Domestic price level	Foreign Exchange Reserves	Exchange rate
Elasticity	1.5228	0.17359	0.27259	-0.17542
VIF	8.20	7.38	3.62	9.52
System Diagnostic Tests				
AR 1-2 test: F (2, 30) = 0.02944 [0.9710]				
ARCH 1-1 test: F(1,35) = 0.43885 [0.5120]				
Normality test: Chi^2(2) = 2.2171 [0.3300]				
Hetero test: F(10,21) = 1.2396 [0.3234]				
Hetero-X test: F(20,11) = 0.76946 [0.7064]				

Foreign exchange reserve is also found to have a significant positive impact on the import demand of the county. Keeping other things constant, a one percent rise or fall in foreign exchange reserves, on average, causes a 0.273 percent rise or fall in imports. Though its economic impact is relatively small, in particular to the size of estimated income elasticity, its turns to be an important determinant of import over the sample period. This implies that foreign exchange reserve (FER) acts as a constraint to import necessary inputs; and that the desired level of import cannot be actualized in the absence of sufficient level of FER reserves. This finding supports the findings of Sewasew (2002) in which he found a positive effect of reserves on import demand in the long run though he established no relationship between imports and real income. It is also similar to the findings of Egwaikhide (1999) for Nigeria and Sultan (2011) for India.

Domestic price level and exchange rate are found to be statistically insignificant at the conventional levels of significance. As to the domestic price level, this result supports the reality on the ground for the import of the nation is comprised of mainly intermediate and capital goods. As the economy keeps on growing, more of such goods are needed to ease the growing needs of the economy and thus, the domestic price level does hardly affect our demand for imports. However, it is important to note that allowing a 10 percent error margin makes domestic price a weakly significant determinant of import demand. But, this is not that recommendable for it needs introducing errors to the model.

By increasing the domestic currency of goods, devaluation of an exchange rate is at least theoretically, as inspired by WB and IMF, meant to boost exports and discourage imports via its role of shifting consumption from domestic to export for exportable and from import to domestic importables (EEA, 2007).But, for a small peasant economy with a little industrial base of ours, devaluation can seldom be effective in inducing substitution of imported goods by the domestically produced ones. This is one possible explanation for the statistical insignificance of the exchange rate in explaining the demand for imports. Moreover, a devaluation measure taken along with trade liberalization may not increase the supply of import substitutes unlike the case where trade is not liberalized at the time of devaluation. This finding supports the theoretical argument of Ghei and Pritchett (1999) and is similar to the findings of Mwega (1993) for Kenya and Mah (1997) for Republic of South Korea.

5.4. Granger Causality Analysis

Having found one cointegrating vector and on the basis of Granger (1986) argument that there must be causality among variables of a model, at least in one direction, provided that there exists a co-integrating vector between those variables, the causality from domestic price level, domestic real income, foreign exchange reserves and real effective exchange rate to imports is examined by estimating the first equation of system (3.16) and the result is reported in Table 5.8.

As can been seen from the table, the first, the second, the third and the fifth null hypothesizes that 3 period lagged coefficient of imports, income, domestic price level and exchange rate are zeros in the short run, which implies that these variables do not Granger cause imports, cannot be rejected at the conventional levels of significance. But, this does not mean that there will not be any significance relationship between them.

Table 5.8: Granger Causality Test Result

Direction of Causation	Short run Causation(with 3 lags)				Long run Causation	
	Chi(χ^2)-square test		F-test		ECT_{1t-1}	
	Statistic	Prob.	Statistic	Prob.	coefficient	Prob.
From M to M	2.4705	0.4807	0.8235	0.4970		
From Y to M	2.1931	0.5333	0.7310	0.5462		
From P to M	2.3213	0.5085	0.7738	0.5229	-1.1660	0.0354
From R to M	10.74711	0.0131	3.5823	0.0331		
From ER to M	1.8095	0.6129	0.6031	0.6209		

Investigating the relationship between imports and foreign exchange reserves, the test result in Table 5.8 suggests that the current change in imports is granger caused, at least uni-directionally, by the first 3 lagged values of the change in reserves as the null hypothesis of no granger causality is rejected at the 5% level of significance. This finding is similar to the finding of Yuan and Kochhar (1994) for China which argues that foreign exchange reserves can be seen as a trigger for the tightening or relaxation of import controls.

So far the long run relationship between imports and the remaining four variables is concerned, the feedback coefficient (-1.1660) is significant at the 5% level of significant suggesting the existence of a causality from income, price, FOREX reserves and exchange rate to imports.

5.5. The Vector Error Correction Model (VECM) of Imports

Once the variables are cointegrated of order one (I(1)) and the long run relationship is established, then follows the determination of the coefficients of the short run import demand equation so that both the short run and the long run could be linked together in a Vector Error Correction Model (VECM).

For modeling the short-run import dynamics, the one period lagged Error Correction Term (ECT_{t-1}) is first generated from the residuals of the cointegrating vector. Then, all the variables are differenced once and entered into the right hand side of the model as regressors to import. It is important to note that a one period lagged error term is used to show how the time path matters in correcting errors. To this end, Hendry and Juselius (2002) argue that rational economic agents, taking all available information at time t , will rationally take actions at period $t + 1$ in order that they could minimize errors.

For estimating the Single-Equation-Error-Correction import demand model, which is specified in Chapter Three, the Hendry's general to specific modeling approach is employed. In this approach, an over-parameterized import model, which includes all differenced explanatory variables along their first lags, is estimated first. Then, highly insignificant explanatory variables are continuously eliminated until a parsimonious model with fewer regressors but robust in terms of significance, economic theory and diagnostic tests are obtained.

The multiple coefficients of determination (R^2) shows that about 55 percent of the variation in imports can be explained by the combined effects of all the explanatory variables included in the short-run import model (Table 5.9 below). The model is adequate in explaining the specified relationship for the F statistic rejects the null hypothesis that all the coefficients of the model variables are jointly insignificant at the one percent error margin. As to the diagnostic tests, the Durbin Watson (DW) test statistic is closer to 2 implying that there is no problem of autocorrelation. The null hypothesizes that the error term is normally distributed; no problem of

misspecification and no problem of hetroscedasticity are not rejected as implied by the Jacque Bera test for normality, Ramsey's RESET test and the autoregressive conditional hetroscedasticity (ARCH) test respectively at the 1 percent level of significance. Moreover, the coefficient of the one period lagged error correction term (ECT_{t-1}) has a negative sign and is statistically significant at 1 percent level of significance.

Table 5.9: The short run dynamic result for the import demand equation

Variable	Coefficient	Standard Error	t-value	t-prob	Part.R^2
Constant	0.0449157	0.02889	1.55	0.130	0.0702
$\Delta \ln Y_t$	1.12150	0.3594	3.12	0.004**	0.2333
$\Delta \ln P_t$	-0.379405	0.2316	-1.64	0.111	0.0774
$\Delta ln R_{t\_1}$	0.106329	0.04387	2.42	0.021*	0.1551
$\Delta ln ER_t$	-0.0334450	0.2589	-0.129	0.898	0.0005
ECT_{t_1}	-0.600191	0.1715	-3.50	0.001**	0.2769
R^2=0.548884	F(5,32) = 7.787 [0.0000]**			DW=1.86	

Diagnostic tests

AR 1-2 test: F(2,30) = 0.85893 [0.4338]

ARCH 1-1 test: F(1,30) = 0.061048 [0.8065]

Normality test: Chi^2(2) = 1.3201 [0.5168]

hetero test: F(10,21) = 0.60549 [0.7920]

RESET test: F(1,31) = 0.12655 [0.7244]

** and * indicates rejection of the null hypothesis at the 1 and 5 levels of error margin

The short run result shows that the change in imports is affected positively and significantly by the current income level and the one period lagged foreign exchange level of reserves. As is in the long run, imports are income elastic and FOREX inelastic. That is a one percent change in real domestic income, changes imports by about 1.122 percent; and a one change in reserves changes the demand for imports by about 0.11percent.

As in the long run, the short run coefficients of domestic price level and exchange rate are not statistically different from zero that both variables fail to explain the variation in the demand for imports.

The coefficient of the one period lagged error correction term (ECT_{t-1}) measures the speed at which the disturbances in the short run could be corrected each year in order that import attains its long run equilibrium. This coefficient has a negative sign and is not greater than unity. It suggests a yearly speed of adjustment of about 60 percent towards equilibrium and whilst its being negative and statistically significant confirms the existence of cointegration between imports and its determinants (Gujarati, 2004). This implies that real import adjusts itself to the equilibrium by about 60 percent in one year and the complete adjustment will take about twenty months.

5.6. Model Stability Test Result

In any regression analysis, the stability of the coefficients of a model is considered to be crucial for policy purpose (Rehman, 2007). Accordingly, the cumulative sum plots of the recursive residual tests are performed to check the stability of the error correction model.

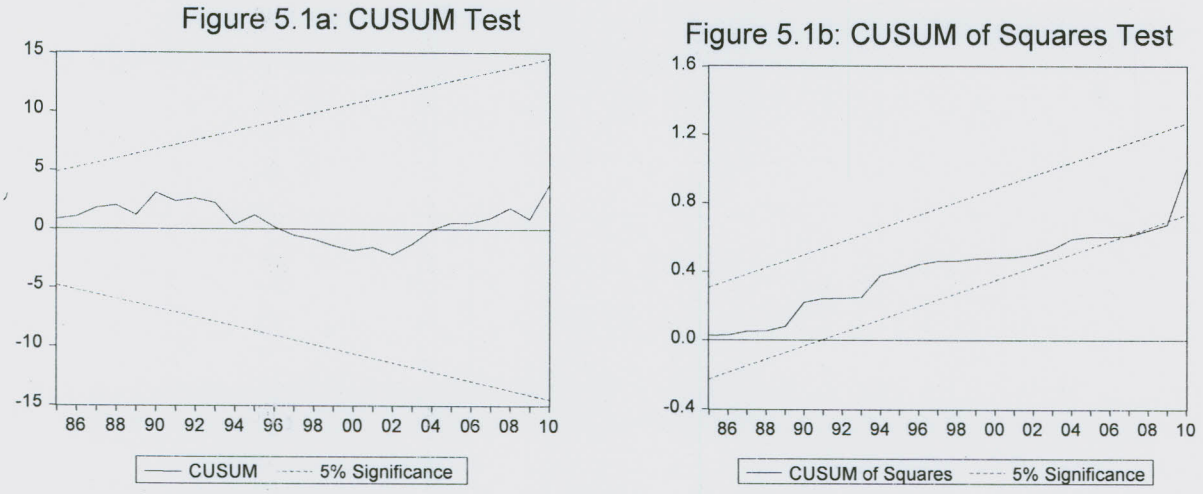


Figure 5.1: VECM Stability Tests Result

Figure 5.1(a) shows that the import demand function remained stable for the sample period for the cumulative sum does not go outside the five percent critical lines. The cumulative sum of squares plot in Figure 5.1(b) too indicates that the residual variance is stable over the sample period since cumulative sum of the recursive residuals squares line lies within the 5 percent critical lines. It is, thus, possible to use the estimated VECM for a policy purpose.

5.7. Variance Decompositions and Impulse Response Functions

Variance decompositions (VDCs) and Impulse Response Functions (IRFs) are important to get the relative effect of an explanatory variable's shock on the endogenous variable of a VAR model. Accordingly, the VDCs and IRFs of the VAR, specified in system (3.2), are employed in the following two sub-sections to the degree of responsiveness of imports to innovations.

5.7.1. Variance Decompositions (VDCs)

Variance decomposition decomposes the sources of variation in an endogenous variable into the component shocks to the VAR variables. That is, VDC provides information about the relative strength of each random innovation or shock in affecting the variables in a VAR model.

Table 5.10: Variance Decomposition of log imports (lnM_t)

Period	S.E.	lnM	LnY	LnP	lnR	LnER
1	0.139488	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.177383	85.35098	2.003318	0.568565	11.86742	0.209717
3	0.208923	67.31901	6.227519	1.378380	24.20671	0.868381
4	0.239473	52.50705	11.38463	2.151728	32.17646	1.780126
5	0.269772	41.58468	16.49614	2.820684	36.42248	2.676013
6	0.299834	33.68010	21.10178	3.392402	38.42000	3.405721
7	0.329620	27.86845	25.07153	3.887922	39.24228	3.929823
8	0.359180	23.47379	28.42637	4.324363	39.50880	4.266683
9	0.388654	20.05101	31.23901	4.712628	39.54308	4.454276
10	0.418237	17.31502	33.59092	5.059121	39.50340	4.531547

The variance decompositions of imports witnesses that a shock to foreign exchange reserve best explains the forecast error variance of imports, next to import itself, up to the fifth period (see Table 5.10 below). From the 5^{th} period onwards, the relative forecast error variance of imports

diminishes implying the relative strength of FOREX reserves in the long run. The relative growth in real GDP also is higher in the long run that it explains more than 30 percent of the forecast error variances of import growth from the 9th period onwards. Domestic price level and exchange rates hardly explain the forecast error variance of import growth.

It is important to note that variance decomposition based on Cholesky factor may change dramatically if the order of the variables in the VAR is changed. Thus, an alternative estimation by interchanging the order of the four explanatory variables is carried out to check for the robustness of the results. This attempt also yielded the same results.

5.7.2. Impulse Response Functions

An impulse response function traces the effect of a one standard deviation shock to one of the exogenous variables on the current and future values of the endogenous variables in a VAR. A shock to the i^{th} variable directly affects the i^{th} variable and could also transmit to all of the endogenous variables through a dynamic structure of the VAR (Stock and Watson, 2001).

Imports respond positively and significantly only to itself in the first period (see Table 5.11). From first period onwards, it positively and significantly responds to output and foreign exchange reserve. In the long-run, imports respond more significantly to changes in output growth than to changes in other variables. The Impulse response functions are graphed (see Appendix VII); and the results are similar to the ones in Table 5.11.

The findings from both the variance decomposition and the impulse response functions supplement the short and long run results that growth in domestic output and FOREX exchange reserve are more important for the prediction of import growth in Ethiopia.

Table 5.11: Impulse Responses of log of Imports to One Standard Deviation

Period	lnM	lnY	lnP	LnR	lnER
1	0.139488	0.000000	0.000000	0.000000	0.000000
	(0.01579)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.086014	0.025107	0.013375	0.061107	0.008123
	(0.02075)	(0.01732)	(0.01183)	(0.01932)	(0.00690)
3	0.050284	0.045694	0.020561	0.082655	0.017693
	(0.02571)	(0.02398)	(0.01696)	(0.02313)	(0.01026)
4	0.026968	0.061729	0.025146	0.088805	0.025334
	(0.02958)	(0.02760)	(0.01976)	(0.02513)	(0.01301)
5	0.012359	0.074004	0.028616	0.089749	0.030441
	(0.03359)	(0.03075)	(0.02192)	(0.02741)	(0.01572)
6	0.003817	0.083458	0.031575	0.089625	0.033380
	(0.03767)	(0.03402)	(0.02408)	(0.02987)	(0.01847)
7	-0.000564	0.090937	0.034270	0.089982	0.034756
	(0.04162)	(0.03744)	(0.02640)	(0.03234)	(0.02123)
8	-0.002157	0.097123	0.036806	0.091290	0.035139
	(0.04540)	(0.04099)	(0.02888)	(0.03479)	(0.02398)
9	-0.001947	0.102538	0.039238	0.093595	0.034983
	(0.04900)	(0.04469)	(0.03144)	(0.03726)	(0.02666)
10	-0.000631	0.107568	0.041605	0.096797	0.034618
	(0.05246)	(0.04864)	(0.03401)	(0.03986)	(0.02927)

5.8. Comparing Forecasts

In this section, the forecasting ability of the conventional partial adjustment and the Johansen approaches to of estimating the import demand function is compared. To this end, the OLS estimates to the conventional model for imports, specified in equation (3.11) of chapter three, is given in Table 5.12.

The estimated partial adjustment model shows that import is responsive only to its lagged values and the current domestic income level. But, it is can also be argued that import has a possibility of responding to lagged values of other explanatory variables as well. Moreover, this model fails to account for the long for a speed of adjustment term unlike the vector error correction model.

Table 5:12: The Estimated Conventional Import Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-3.828226	1.913367	-2.000780	0.0540
lnM_{t-1}	0.472015	0.129060	3.657339	0.0009
lnY_t	0.873346	0.288251	3.029805	0.0048
lnP_t	-0.060216	0.097999	-0.614452	0.5433
lnR_t	0.091023	0.047350	1.922338	0.0635
$lnER_t$	0.082178	0.130557	0.629441	0.5335

Table 5.13 reports several objective criteria that could be used to evaluate the forecast performance of the two models. The root-mean-squared error (RMSE), the mean absolute error (MAE), and the Mean Absolute Percentage Error (MAPE) of the conventional import model are higher than that of the Johansen's model. It could, thus, be concluded that that the error-correction model outperforms the conventional model for estimating import demand equation.

Table 5.13: Comparing the conventional and Johansen import models

Criteria	Conventional	Johansen
Root Mean Squared Error	0.145687	0.11403
Mean Absolute Error	0.11309	0.08969
Mean Absolute Percentage Error	0.99114	0.78866

In nutshell, the econometric analysis supplements the descriptive analysis that that real GDP and foreign exchange reserves are major short run and long run import demand determinants of Ethiopia. While exchange rate is entirely ineffective, domestic price level weakly (at 10 percent level of significance) determines import demand only in the short run.

CHAPTER SIX

CONCLUSION, POLICY IMPLICATIONS AND DIRECTIONS FOR FURTHER RESEARCH

The first part of this chapter goes through the conclusions while the second one spots out policy implications drawn from the findings of the study. The third and final section points out available room(s) for further research.

6.1. Conclusion

The simple descriptive analysis shows that imports of Ethiopia have generally been increasing since the late 1990s which could chiefly be attributed to the relative openness of the economy, the fast economic growth over the past decade, the relatively rising foreign exchange reserves of the county; and the insignificant effects of exchange rate and inflation. Though not that big, the share of capital goods has been greater than that of consumer goods as of the year 2010/11.

To supplement the descriptive analysis, an aggregate import demand model for Ethiopia is specified as a function of domestic income, domestic price level, foreign exchange reserves and exchange rate; and is estimated on the basis of cointegration and Error Correction Models with annual data for the period 1970/71 to 2010/11. Prior to estimating models, unit root rests are conducted and the variables of the model are found to be cointegrated of order one, I (1).

The VAR analysis result predicts one cointegrating vector between import, domestic income, domestic price level, foreign exchange reserves and exchange rate. The weak exogeneity test tells that import is the only dependent variable and the exclusion test speaks that only domestic income level and foreign exchange are statistically significant in explaining both the long run and the short run variation in import of the country while the domestic price level and exchange rate are found to be statistically insignificant. The long run impact of income and foreign exchange reserves is higher than its short run counterpart. That is, the long run import demand elasticity of income and foreign exchange reserves are about 1.522 percent and 0.273 percent respectively while their short run values are 1.122 percent and 0.106 percent in the same order.

Stability tests are employed to find out the usefulness of the specified VAR and VEC import demand models for a policy purpose. These tests proved that the estimated long run and short-run relationships are stable over the sample period that the models can be used for policy purpose.

Granger Causality, Variance decompositions (VDCs) and Impulse Response Functions (IRFs) tests are employed to supplement the findings of the study. The Granger causality test reveals that domestic income, domestic price level, and exchange rate and foreign exchange reserves jointly Ganger cause imports in the long run while it is only foreign exchange reserves that Granger causes imports in the short run. VDCs indicate that import of the country is highly sensitive to itself only in the short run; and foreign exchange reserves and domestic income level explain a significant portion of forecast error variances of imports in the long run. Similarly, the plots of IRFs shows that import responds positively and significantly to output and foreign exchange reserves in the long run though it positively and significantly responds to itself in the Short run.

Finally, the conventional partial adjustment model of import demand, where import is regressed on its first lag and on the current values of domestic income level, foreign exchange reserves, domestic price level and exchange rate is estimated and its forecasting performance is compared to the Error-Correction Model. Such an evaluation proved that the error-correction model predicts turning points with a greater degree of accuracy than the conventional partial adjustment model that the estimates obtained from the former are robust.

6.2. Policy Implications

On the basis of the findings of the study, the following policy implications are drawn;

First, the relatively higher long run income elasticity of import demand predicts the dependency of the county on imported inputs of production, especially on capital goods, over longer time horizons. Under such a situation, imports grow at a faster rate than the growth of income of a country and would deteriorate the trade balance of the country unless the growth in imports is accompanied by the growth in exports. This represents a key risk to the balance of payments of the nation for a few exportable commodities are fetching its export earnings. That is, the limited production capacity of the nation along with the rising import demand for imports (especially of

consumer goods) places a pressure on the balance of payments of the country. It is, thus, highly advisable to diversify production in order that this reliance on few exports and huge imports would be minimized. In particular, it should be worked to boost the productivity and international competitiveness of the export sector.

Second, the lower short run income elasticity suggests the effective room available for import substitution. The share of consumer goods in the total import value is, on average, not less that 30 percent[7] between 1994/94 and 2009/10 which makes it the second largest component of the country's import; and the foreign exchange reserve is found to have a positive effect on import. It can be inferred from this that a considerable portion of FOREX reserves are being spent on consumer goods which would otherwise be used for the purchase of domestically unavailable production inputs. This shows how important it is to find domestic substitutes so that the share of consumer goods in the total import would at least be minimized.

Another policy option would be that of supplementing devaluation with import restriction. The empirical findings show that devaluation has seldom been effective in reducing imports. This being the case; the descriptive analysis reveals that consumer goods take the lion's share of the country's import volume. To this end, devaluating more may cut imports. But, this can only be achieved at the cost of losing necessary inputs to the production process since the Ethiopian economy is an import dependent one. Thus, it is recommendable to supplement the exchange rate policy with impose restrictions targeting luxury (consumer) items instead of sorting to a more devaluating policy.

6.3. Directions for Further Research

Almost all of the researches conducted on the import demand equation in Ethiopia, including this study, sorted to estimate an aggregate demand model. But, it is equally important to estimate a disaggregated import demand model so as to capture the effect of policy measures on consumer, intermediate and capital goods. In addition, an import demand equation has to account for variables such as trade openness, terms of trade and export. Moreover, the use of annual data may not permit to see the seasonal variation in the demand for imports. Thus, there are possible gaps that a forth coming research may close.

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[7] See Table 4.1 in Chapter Four

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Appendixes

Appendix I: PP Unit Root Test Result

Variable	Specification	**PP** test statistic	1% critical value	5% critical value	P-value	Order of Integration
lnP	without C&T	-0.1738	-2.625	-1.949	0.620	I(1)
	With C	0.0071	-3.616	-2.941	0.950	
	With C&T	-1.6981	-4.211	-3.529	0.730	
ΔlnP	with C	0.5479	-3.615	-2.941	0.870	I(0)
	With C and T	0.1783	-4.219	-3.533	0.997	
	Without C&T	-1.0585	-2.627	-1.949	0.256	
lnY	With C	7.524	-3.610	-2.939	1.000	I(1)
	With C and T	1.472	-4.211	-3.529	1.000	
	without C&T	3.789	-2.625	-1.949	0.9999	
ΔlnY	With drift (C)	-4.7188	-3.615	-2.941	0.0005	I(0)
	With C and T	-6.0518	-4.219	-3.533	0.0001	
	Without C&T	-3.638	-2.627	-1.949	0.0006	
lnM	With C	1.896	-3.610	-2.939	0.9999	I(1)
	With C &T	-0.524	-4.211	-3.529	0.9780	
	Without C&T	5.339	-2.625	-1.949	1.0000	
ΔlnM	With C	-6.2173	-3.616	-2.941	0.0000	I(0)
	With C &T	-6.6040	-4.219	-3.533	0.0000	
	Without C&T	-4.0548	-2.627	-1.949	0.0002	
lnER	With C	-0.6194	-3.610	-2.938	0.8546	I(1)
	With C & T	-2.1947	-4.211	-3.529	0.4791	
	Without C&T	-0.8974	-2.625	-1.949	0.3211	
ΔlnER	With drift	-5.2917	-3.616	-2.941	0.0001	I(0)
	With C & T	-5.3002	-4.219	-3.533	0.0006	
	Without C&T	-5.2848	-2.627	-1.949	0.0000	
lnR	With C	-1.8066	-3.610	-2.939	0.3719	I(1)
	With C & T	-2.6049	-4.212	-3.529	0.2804	
	Without C&T	0.9991	-2.626	-1.949	0.9132	
ΔlnR	With C	-6.0488	-3.615	-2.941	0.0000	I(0)
	With C & T	-6.1939	-4.219	-3.533	0.0000	
	Without C&T	-5.8318	-2.627	-1.949	0.0000	

Appendix II: Growth rate of real GDP, Import and Import Penetration Rate

Fiscal Year	Percentage Share of Imports in real GDP	growth rate of imports	Growth rate of real GDP	Fiscal Year	Share of imports in real GDP	Growth rate of imports	Growth rate of real GDP
1970/71	5.313661	-1.52188	3.738199	1990/91	7.29323	-10.1188	-2.63027
1971/72	5.04423	12.87871	3.130143	1991/92	5.665387	16.39996	-6.224
1972/73	5.521046	2.157579	2.699098	1992/93	6.119694	27.83194	11.22415
1973/74	5.491934	-11.3416	2.237439	1993/94	6.217566	63.55803	0.759292
1974/75	4.762501	15.34096	2.593738	1994/95	9.844979	67.48021	4.607697
1975/76	5.35424	20.41366	-0.23552	1995/96	13.88804	30.53116	12.10294
1976/77	6.462456	-12.7555	0.366221	1996/97	16.28086	9.704075	4.550216
1977/78	5.617565	21.20561	-0.4016	1997/98	17.07715	21.3641	-3.4582
1978/79	6.836259	14.91644	5.092371	1998/99	21.56235	7.147036	5.162409
1979/80	7.475314	5.923551	6.233973	1999/00	21.82423	24.33803	6.072856
1980/81	7.453471	26.20233	0.681566	2000/01	23.93574	0.975254	8.301434
1981/82	9.342777	-10.8659	-1.52677	2001/02	23.67942	9.923324	1.514716
1982/83	8.456719	6.286677	11.15951	2002/03	26.60416	13.69199	-2.16108
1983/84	8.086007	5.386202	-6.69717	2003/04	27.41474	35.94174	13.57236
1984/85	9.133202	-14.4902	-13.8732	2004/05	31.57913	38.03701	11.81884
1985/86	9.067775	3.747118	11.51951	2005/06	35.47976	27.30848	10.83463
1986/87	8.435793	20.22012	16.19813	2006/07	36.53288	14.54575	11.45602
1987/88	8.727783	-2.98828	0.146068	2007/08	32.02982	38.98585	10.78887
1988/89	8.454623	-2.48261	0.755655	2008/09	30.83505	25.75753	8.791922
1989/90	8.182893	-7.81647	3.428506	2009/10	28.70933	31.19237	12.42801
1990/91	7.29323	-10.1188	-2.63027	2010/11	32.95012	28.6805	11.30996

Source: Own computation on the Basis of MOFED (2012) and EEA (2012) data

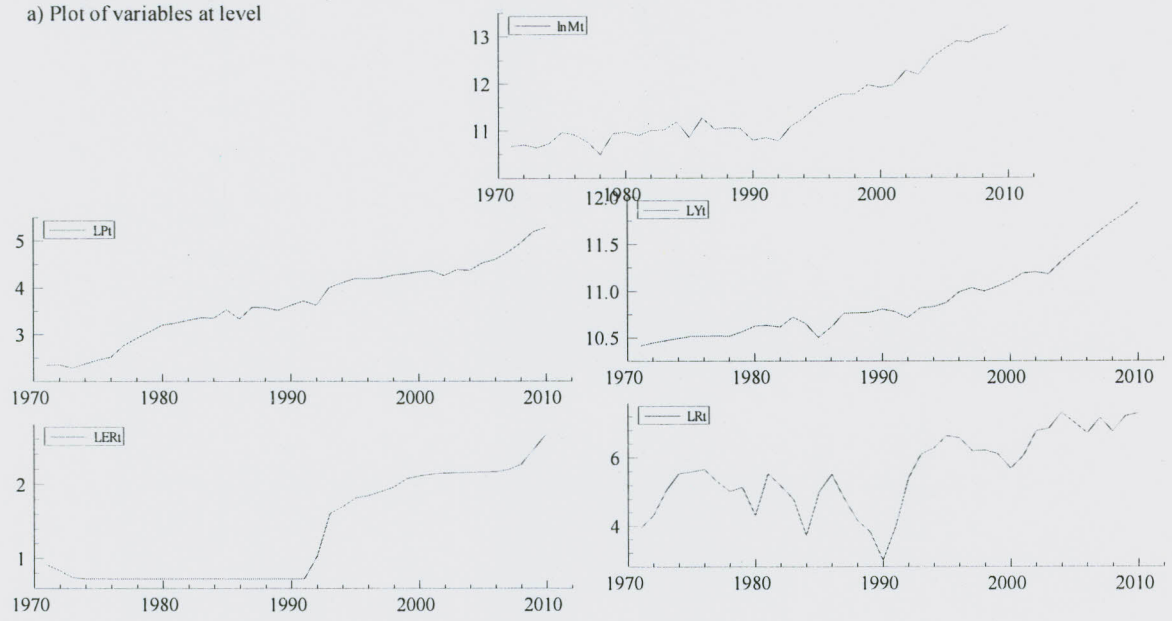
Appendix III: Percentage Share of Ethiopian Imports by Country of Origin

No	Country/Group	Percentage share in			
		1984/85	1990/91	2003/04	2009/10
1	Russia	18.3	8.4	1.0	1.0
2	**Europe**	**37.2**	**35.1**	**22.8**	**9.9**
	Italy	9.5	12.5	10.7	4.8
	Germany	12.5	10.5	3.8	2.3
	UK	9.1	6.3	3.5	1.0
	France	3.2	2.9	2.4	1.0
	Netherlands	2.8	2.9	2.5	0.9
3	**Middle East**	**0.9**	**3.7**	**17.9**	**17.7**
	Saudi Arabia	0.8	3.5	8.4	12.7
	United AE	0.1	0.2	9.5	5.0
4	**Africa**	**0.61**	**3.7**	**3.3**	**1.6**
	Sudan	0.005	0.001	0.36	1.2
	Kenya	0.3	2	0.7	0.4
	Djibouti	0.3	1.7	2.2	0
5	**East Asia**	**8.8**	**7.7**	**14.8**	**30.1**
	Japan	8.4	7.2	4.5	5.0
	China	0.4	0.5	10.3	17.5
	India				7.6

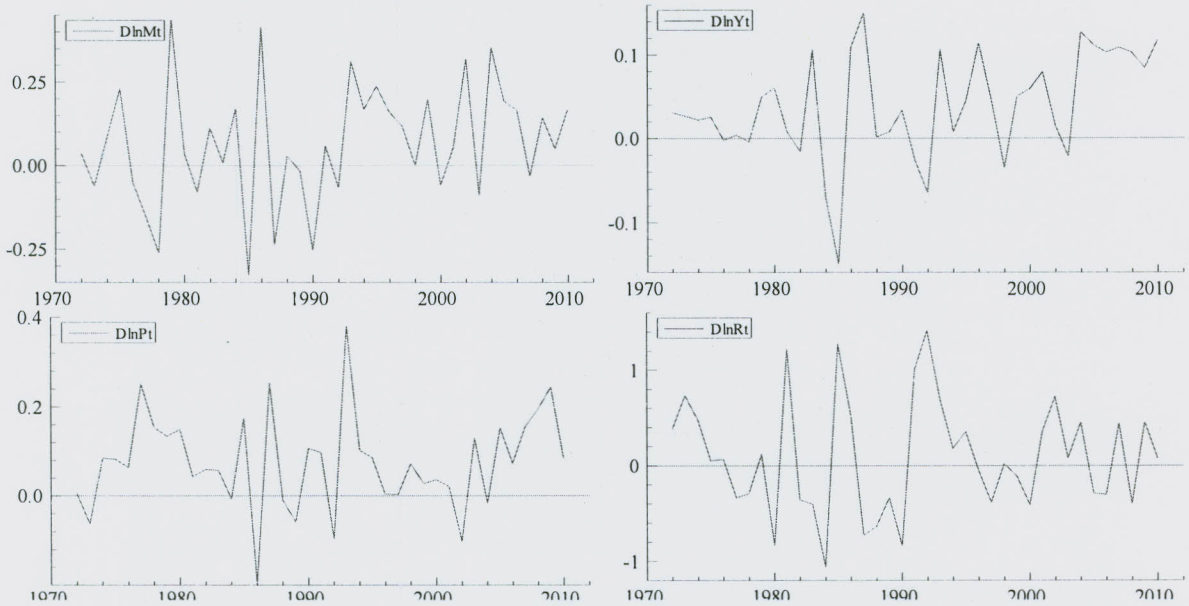
Source: Ethiopian Ministry of Trade and Finance (2011)

Appendix IV: Plots of Study Variables

a) Plot of variables at level



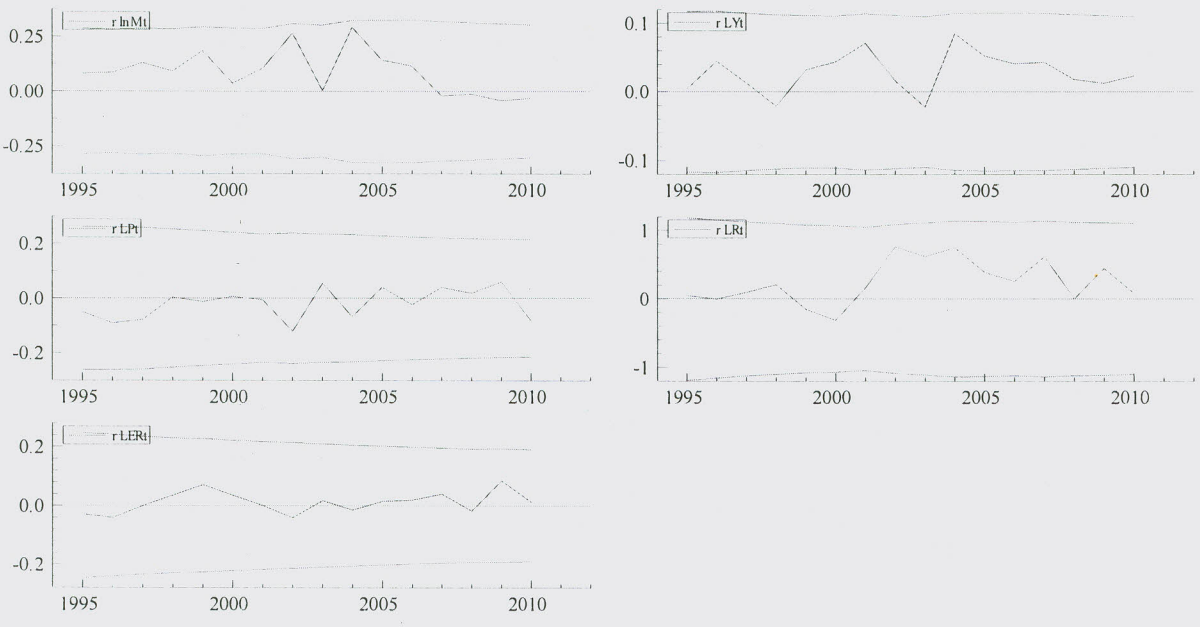
b) Plot of the variables at their 1st difference



Appendix V: Long run Model Diagnostic Test Result

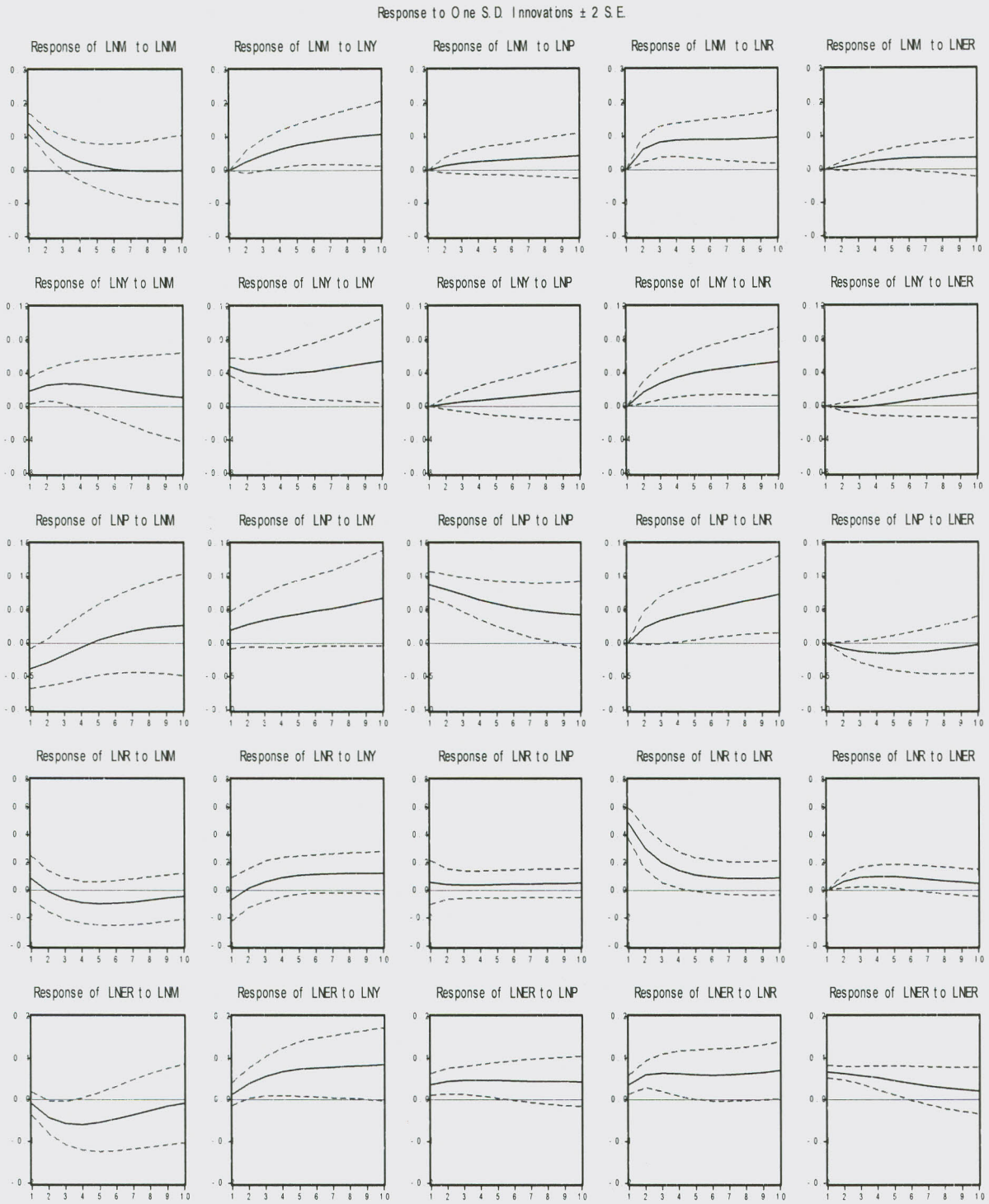
lnMt :Normality test: Chi^2(2) = 4.4259 [0.1094] lnYt : Normality test: Chi^2(2) = 3.6565 [0.1607] lnPt : Normality test: Chi^2(2) = 4.8883 [0.0868] lnRt : Normality test: Chi^2(2) = 1.5023 [0.4718] lnER :Normality test: Chi^2(2) = 29.318 [0.00]**	lnMt :AR 1-2 test: F(2,31) = 1.6565 [0.2073] lnYt: AR 1-2 test: F(2,31) = 3.1329 [0.0576] lnPt: AR 1-2 test: F(2,31) = 3.9886 [0.0287]* lnRt : AR 1-2 test: F(2,31) = 0.76071 [0.4759] lnERt: AR 1-2 test: F(2,31) = 0.74410 [0.484]
lnMt: hetero test: F(10,22) = 1.6817 [0.1486] lnYt : hetero test: F(10,22) = 1.0468 [0.4397] lnPt : hetero test: F(10,22) = 0.76207 [0.6622] lnRt : hetero test: F(10,22) = 2.0062 [0.0834] lnERt : hetero test: F(10,22) = 1.0835 [0.4149]	lnMt : ARCH 1-1 test: F(1,31) = 0.54699 [0.465] lnYt : ARCH 1-1 test: F(1,31) =2.5427 [0.1210] lnPt : ARCH 1-1 test: F(1,31) =2.3101 [0.1387] lnRt : ARCH 1-1 test: F(1,31) = 0.44186 [0.511] lnERt : ARCH 1-1 test: F(1,31) = 0.57073 [0.456]
lnMt : hetero-X test: F(20,12) =1.1412 [0.4181] lnYt : hetero-X test: F(20,12) = 1.7218 [0.1675]	lnPt :hetero-X test: F(20,12) =0.8769 [0.0321]* lnRt : hetero-X test: F(20,12) = 1.4882 [0.2420] lnERt : hetero-X test: F(20,12) = 2.6694 [0.042]*

Appendix VI: Long Run Stability Test Result [8] (Recursive Graphics)



[8] The fact that the plot of recursive residual stays within the critical lines implies that the VAR is stable

VII: Plots of Impulse Response Functions



DECLARATION

I, undersigned hereby, declare that this thesis is prepared with my own effort that it has not been presented for a diploma or a degree requirement in this or any other University; and all sources of materials used for thesis work have been duly acknowledged. I have submitted this Thesis to Jimma University as of May 31st, 2013 and I agree to accept any responsibility for the scientific and ethical mischief pertaining to this research work as per terms and conditions of Jimma University.

Student's Name Abreham Mengistu

Signature

Name of the institution Jimma University

Date of Submission 31/05/2013

Advisors' Approval

This Thesis has been completed and submitted for examination with our approval as Advisors to Jimma University.

Hassen Abda		31/05/2013
(Main-Advisor)	Signature	Date
Idris Temesgen		31/05/2013
(Co-advisor)	Signature	Date