ANALYSIS OF THE DETERMINANTS OF IMPORTS IN KENYA: AN AUTOREGRESSIVE DISTRIBUTED LAG BOUNDS TESTING APPROACH

BY

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DECLARATION

Declaration by the Candidate

This research thesis is my original work and has not been presented for a degree in any other University for any award. No part of this work may be reproduced without the prior written permission of the author and/or Moi University

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DEDICATION

This thesis is dedicated to my loving and ever-supportive father

Mr. Joshua Wanyonyi.

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ABSTRACT

This study examined the determinants of aggregate imports in Kenya using time series data from 1980 to 2017. The theoretical underpinning of this study was the benchmark model which postulates that an aggregate import demand equation relates imports demanded by a country to the ratio of import prices to domestic prices and domestic income. The thrust of this model is in consumer theory. The study augmented the model by introducing additional explanatory variables and hypothesized that import price index (IPI), Domestic price index (DPI), real income (RINC), exchange rate (ER) and real foreign reserves (RFR) were determinants of imports in Kenya. The study used the Autoregressive bounds testing approach to test for cointegration. The bounds test of cointegration revealed that there was a long run association among the variables in the import demand function. The short run coefficients indicate that DPI was the main determinant of imports in Kenya with a coefficient of 0.925 indicating that significant reduction in prices of domestically produced goods will lead to a fall in imports holding other factors constant. The coefficient of IPI was negative and significant while real income did not significantly influence the country's imports. Real foreign reserves and lagged exchange rate also had a significant effect on imports in the short run. The coefficient of the error correction term was -0.652 and was significant at 1 per cent implying that the model will settle at long run equilibrium. The most important determinant of Kenya's imports in the long run was DPI as was the case in the short run. This was followed by IPI whose coefficient was negative and significant at 1 per cent. Real income and exchange rate do not significantly affect imports in the long run. The estimated ECM was subjected to stability test using CUSUM test, autocorrelation test using the Breusch-Godfrey Serial Correlation LM test and Heteroscedasticity test using Breusch–Pagan–Godfrey test. Therefore, the study concluded that Kenya's imports are mainly determined by prices of domestic goods, import prices, foreign reserves, and exchange rate. Consequently, the study recommends that policies aimed at managing (or reducing) the level of imports should target price of domestic goods as well as price of imports. Trade restrictions such as tariffs and import quotas that would affect import prices would be effective in managing the level of imports.

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ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Lag
BD	Budget Deficit
BOP	Balance of Payments
CBK	Central Bank of Kenya
COMESA	Common Market for East and Southern Africa
CPI	Consumer Price Index
ECM	Error Correction Model
EG	Engel-Granger
FBT	Food Beverages and Tobacco
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IMF	International Monetary Fund
JJ	Johansen Juselius
KES	Kenyan shilling
KNBS	Kenya National Bureau of Statistics
MFL	Mineral Fuels and Lubricants
MG	Manufactured Goods
MTE	Machinery and Transport Equipment
NGDP	Nominal Gross Domestic Product
OLS	Ordinary Least Squares
PIG	Primary Intermediate Goods
PP	Phillips Peron

REER	Real Effective Exchange Rate
SVAR	Structural Vector Autoregressive
USD	United States Dollar
VAR	Vector Autoregressive
WTO	World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1 Background Information

In the wake of globalization, the interdependence among countries at world level has tremendously increased. Every country wants to achieve rapid economic growth and development. Countries hope to achieve this through among other strategies, reaping maximum benefits from international trade. In fact, trade among the nations is almost unavoidable (Chani & Chaudhary, 2011). And, with the implementation of the World Trade Organization (WTO) rules and substantial reduction in trade restrictions, most of the developing countries' imports are increasing rapidly (Bayo & Awomuse, 2014). Kenya's economy is not an exception as it is a member of WTO and is largely import dependent.

The importance of imports in an economy has been demonstrated by Nyoni (2004) who indicated that imports bridge the gap between domestic production and domestic aggregate demand. Raw material and intermediate goods imports are also a source of growth in domestic income. Veeramani (2008) alluded that countries that use imported intermediate products and capital equipment derive benefits because these products embody foreign knowledge. According to him, spillovers arise in this process of knowledge diffusion to the extent the imported products cost less than their opportunity costs – including the research and development (R&D) costs to develop them. He also alluded that imports might facilitate learning about the products (for example, reverse engineering), spurring imitation or innovation of competing products. His argument was like that in Chuang (1998) who stated that trade relationships stimulate personal interaction and other channels of communication leading to cross border learning of production methods, product design, organizational methods, and market conditions.

Thus, countries import new goods, learn how to produce them, then produce them by themselves, and eventually export them. Other prominent supporters of importation are (Bathalomew, 2010), (Chani & Chaudhary, 2011) and (Sanghi & Johnson, 2016). In a nuteshell, imports bridge the gap in domestic demand, increase competition in the domestic market thereby enhancing efficiency, improve local production capacity through capital imports and is a source of technology transfer.

A contrary opinion on the effect of imports to an economy has been advanced by many economic scholars and policy makers. The argument against importation can be traced back to the mercantilist ideas. Mercantilists advocated that for a country to increase its wealth (specie), they needed to hold down importation as much as possible while at the same time increase its exports. They proposed that no importation be allowed if such goods were sufficiently and suitably supplied at home (Landreth & Colander, 2002). Imports are a withdrawal of income flows from an economy according to Andolfatto (2008). Further, Rogers, (2000) suggested that imports adversely affect the balance of trade position of a country while George (2007) indicated that trade deficit displays a macroeconomic disequilibrium and slows down economic growth. Therefore, according to George (2007), imports have a negative impact on economic growth of a country. Sharma et. al., (2005) show that import surge often stirred the competition between imported and domestic products and led to the fall in domestic price, especially when the two products are substitutes. They cited examples of countries in which imports have totally outdone locally produced goods in terms of pricing as Kenya, Côte d'Ivoire, Mozambique, Philippines, and the United Republic of Tanzania. Consequently, domestic producers, especially infant industries are crowded out. This leads to massive job losses in the domestic economy. In the case of agricultural products, Sharma et. al., (2005) indicate that a fall in domestic products occasioned by

competition from foreign producers leads to a fall in domestic production. This aggrevates the problem of unemployment and further slows down economic growth.

For most develpoing countries like Kenya, the import bill has been on an upward trajectory over the past two decades. While these economies are faced with real challenges posed by importation, opportunities presented by importation abound. However, since growth in imports have far much outweighed growth in exports, these economies have experienced ever widening trade deficits. Data from the KNBS (2017) indicate that Kenya's trade deficit has continued to widen due to the surge in imports. The sectors that may have sufferred due to importation in Kenya include the cotton and sugar industries due to heavy importation of second hand closthes and cheap sugar respectively. On the other hand consumers have been offered a wider range of choice for these products at lower prices thereby increasing their surplus. At the same time, the country has benefited immensely from importation of machinery and equipment which are used to produce other goods and services locally. Importation has also enabled to country to build masive infrastucture projects.

Common determinants of imports are prices of imports, prices of domestically produced commodities, domestic income, exchange rates, trade openness, availability of foreign exchange and interest rates. The effects of each of these variables on growth in imports vary from country to country. These determinants have been demonstrated in Mwega (1993), Cevik (2001), Dutta and Ahmed (2006), Muluvi et. al. (2014), Mairura and Swammy (2015), Myeni (2017), Mairura (2019) and others. The effect of these variables on imports not only varies from country to country but also vary for different categories of imports at different time periods.

1.2 Stylized Facts about Kenya's Economy and the Behavior of Imports

Kenya is a classified as a lower middle income economy (World Bank, 2018) and is home to an estimated population of 46.6 million people as of 2017 (Kenya National Bureau of Statistics, 2018). World Bank (2018) statistics indicate that the economy has reported a slow but consistent growth in the GDP since 1960. This is depicted by the graph of GDP (constant million KES.) in figure 1.1. On the vertical (Y) axis are the amounts for GDP, imports and exports of goods and services at constant KES. The figures are in millions.

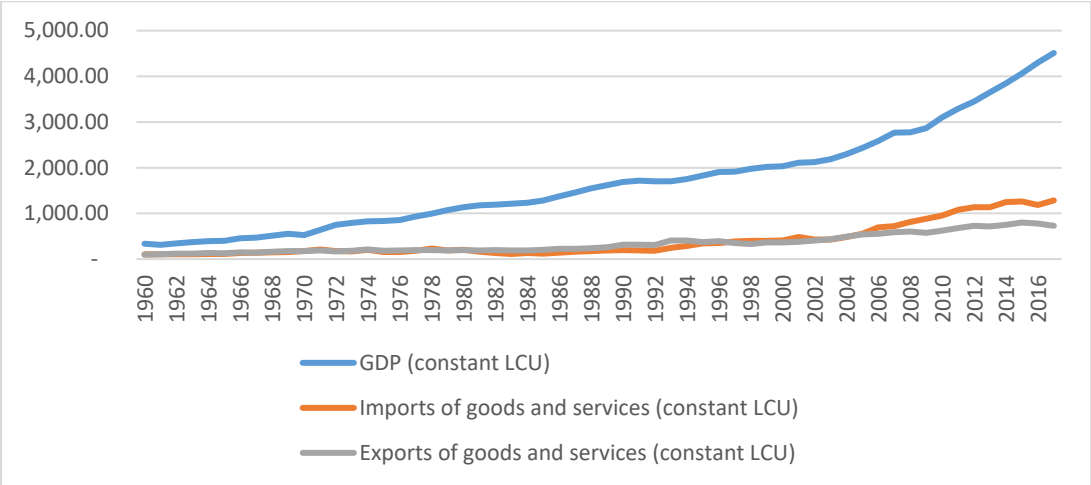

Figure 1.1: Trends in Kenya's GDP, Imports and Exports, 1960-2017
Source: World Development Indicators, World Bank 2017

The figure indicates that total imports of goods and services has been on an upward trend with the highest rates of growth reported between years 2006 to 2017. It is also evident that, compared to the country's exports, imports have grown at a much higher pace in the past decade. This is indicates a consistently widening trade deficit.

In terms of composition of the country's imports, industrial nonfood supplies constitute the largest share of Kenya's imports. For example, in 2017 they accounted for 31.93 percent of total imports. Machinery and equipment imports came second at 18.01 percent while fuel and lubricants were third at 16.09 percent. Imports of food and

beverages comprised 14.21 percent of the total imports for the same year (Kenya National Bureau of Statistics, 2018). Table 1.1 that follows summaries the share of Kenya's imports

Table 1.1: Composition of Kenya's imports by broad economic category, 2013-2017

Import category	**Share of total imports in each year**				
Year	**2013**	**2014**	**2015**	**2016**	**2017**
Food and Beverages	7.19	6.91	7.82	8.00	14.21
Industrial supplies (Non-food)	31.87	28.56	33.25	36.23	31.93
Fuel and Lubricants	23.09	21.43	15.04	14.53	16.09
Machinery and Other Equipment	17.75	17.22	18.23	21.8	18.01
Transport Equipment	11.38	17.22	16.92	10.3	11.44
Others	8.72	8.66	8.74	9.14	8.32
Total	100	100	100	100	100

Source: Economic Survey 2018, Kenya National Bureau of Statistics (2018)

Kenya's imports largely originate from Asia. Other sources of Kenya's imports are Africa, America and Europe. Figure 1.2 below indicates that Country's imports from these regions have been growing. However, imports from Asia have recorded the hightest growth from Ksh 896,700,000 in 2013 to about Ksh 1,107,583,000 in 2017. This has been fueled by a rise in imports from China, India, the United Arab Emirates and Saudi Arabia. For instance, Chinese imports have more than doubled since 2013 from only Ksh 182,356,000 to over Ksh 390,000,000 in 2017. Kenya National Bureau of Statistics (2018) shows that Chinese imports into Kenya overtook India's imports in 2015 meaning that the largest source of Kenya's imports at the moment is China followed India. There is also great likelihood that Kenya imports even more from China and India because many imports from the United Arab Emirates (UAE) are re-exported

manufactured products such as phones, computer monitors, or jewelery originally from China and/or India (Sanghi & Johnson, 2016).

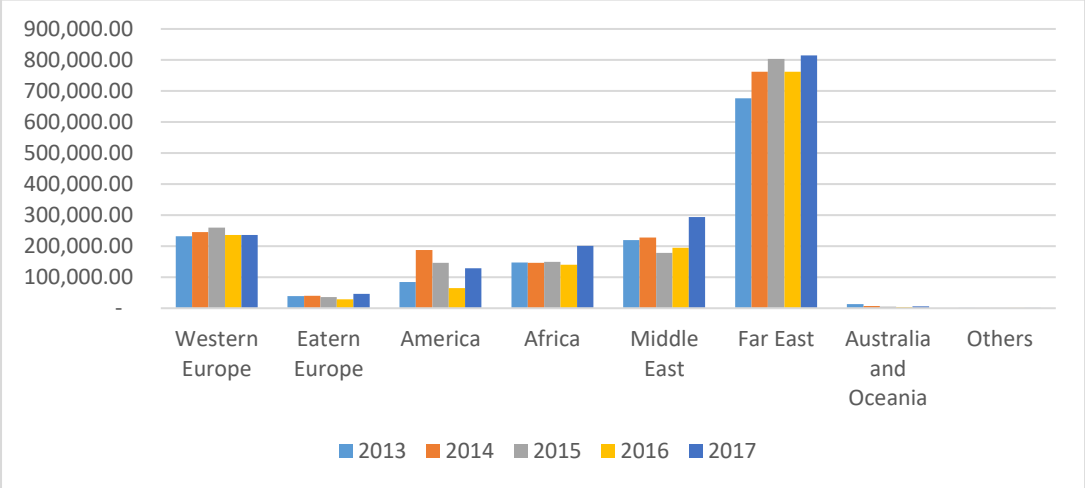

Figure 1.2: Values of Kenya's imports by origin, 2013-2017
Source: Economic Survey 2018, Kenya National Bureau of Statistics (2018)

1.3 Problem Statement

Kenya's imports have been on an upward trend throughout the postcolonial period with the fastest growth rates recorded in the 1990s and 2000s.This is indicated in figure 1.1. On the contrary, exports have been growing at a sluggish pace. This has led to huge balance of trade deficit that has put pressure on the Kenya shilling because of limited foreign exchange generation from export activities. The country's trade deficit stood at Ksh 1.1 trillion in 2017 up from Ksh 0.9 trillion in 2013. Kenya's trade policy is cognizant of the prevailing balance of trade position and attributes it to rising imports and slow growth in exports (State Department for Trade, 2017). The policy document elucidates the constraints and challenges affecting market access for Kenya's exports and clearly outlines policy objectives and measures to enhance market access for exports. No significant attention is given to imports in the policy document. The lack of sufficient attention to imports has not only been demonstrated at policy level. It has also been manifested by most researchers and economic scholars who have relegated

the role of imports and concentrated heavily on exports. There is also a rapid increase in imports from Asia and particularly China. Table 1.1 also depicts that the country heavily relies on imports for its manufactured goods. This is evident in most stores in urban areas in the country where common items like utensils, toys, clothing, furniture, construction equipment and electronics are imports. It is indeed not proud for any Kenyan to find that most of their expenditure on household goods and equipment is on foreign products.

Rising imports may present threats to the Kenyan economy. The first threat is that of a widening trade deficit. Empirical evidence has shown that a widening trade deficit stifles economic growth. For instance, George (2007) demonstrated that trade deficit displays a macroeconomic disequilibrium and slows down economic growth. He alluded that trade deficit implies that foreign trade has a negative impact on growth in GDP. Secondly, importation of goods that are produced locally amounts to competition to local producers. The local manufactures in Kenya have been no match to efficient manufacturers such as those in China and India (Sanghi & Johnson, 2016). As a result, they are threatened by cheap imports putting tens of thousands of jobs on the line due to closure of local industries. Kenya is also characterized by massive importation of final goods for consumption. For example, Sanghi and Johnson (2016) indicate that Kenya heavily imports second hand clothes. This leads to crowding out of local producers and amounts to exportation of the country's income. Eventually, it creates the need for government protection through subsidies to local firms and import restriction which lead to further resource misallocation.

Imports *per se* are not detrimental to the performance of an economy. According to Veeramani (2008), imports are a vital component of the economy. Importation of capital and intermediate goods helps to enhance the productive capacity and

competitiveness of an economy thereby increasing the rate of growth in the long run. Imports can also be a source of technology transfer and learning through positive externalities. Imports, apart from meeting any shortfalls in local supply also create an avenue for competition in the local economy which leads to more efficiency. Sanghi and Johnson (2016) alluded that cheap imports from China and India increase competition which forces uncompetitive firms out of the market and eliminates the deadweight loss in the domestic economy. Accordingly, imports lead to an increase in overall welfare of the society. Growing levels of imports may also indicate robust domestic demand and a growing economy.

The foregoing discussion reveals that rising imports could have far reaching repercussions on the Kenyan economy. It is therefore paramount that Kenya's trade policy be cognizant of the factors that are behind the surge in the country's imports. Yet, empirical literature on the determinants of imports in Kenya is hard to come by. At the same time, there is no consensus on what can be taken as determinants of imports in Kenya. For example, while Muluvi et. al., (2014) consider only GDP, foreign reserves, real exchange rate, Foreign Direct Investment (FDI) net inflows and trade openness as the determinants of imports in Kenya while Mwega (1993) only considers GDP, relative prices, foreign reserves.

1.4 Objectives of the Study

1.4.1 General Objective

The overall objective of this study was to analyze the determinants of aggregate imports in Kenya

1.4.2 Specific objectives

i. To determine the effect of import price index on Kenya's imports

ii. To find out the effect of domestic price index on imports in Kenya

iii. To establish the effect of the country's real income on imports

iv. To determine the effect of exchange rates on imports in Kenya

v. To establish the effect of real foreign reserves on Kenya's imports

1.5 Hypotheses

To achieve the above stated objectives, the study tested the following hypothesis

$\mathbf{H0_1}$: Import price index does not significantly affect imports in Kenya

$\mathbf{H0_2}$: Domestic price index does not significantly affect imports in Kenya

$\mathbf{H0_3}$**:** Real income not significantly affect imports in Kenya

$\mathbf{H0_4}$**:** Exchange rate does not significantly affect imports in Kenya

$\mathbf{H0_5}$**:** Real foreign reserves do not significantly affect Kenya's imports

1.6 Justification of the Study

First, the findings of this study will go a long way in informing policy makers within the department of trade about the real causes of the surge in Kenya's imports and the persistent trade imbalance. This will enable them draw more suitable policies in order to correct the unfavourable trade balance. The study findings are also helpful to the country as it seeks to grow its manufactruing sector which is in major competition with imports. The study contributes to policies aimed at driving the country towards prosperity as envisaged in the Vision 2030.

Secondly, previous research on international trade, trade imbalance, foreign exchange problems and economic growth have focused mainly on exports. Few studies have tried to establish the determinants of imports. In addition, there is no general consensus on what can be taken as the exact determinants of imports. For example, Cevik (2001) used GDP, and Real Effective Exchange Rate (REER) as a variable that represented the

relative price ratio in his import demand model for Turkey. Her study didn't capture relative price as a separate explanatory variable in the model. In India, Dutta and Ahmed (2006) considered import prices (not relative prices) but ignored real level of foreign exchange receipts, real international reserves. Hemphill (1974) stresses that the two variables are crucial in the import demand model. Otoro (2008) used GDP, relative price, Real effective exhange rate and a dummy variale capturing both the command regime and free market regime to estimate Ethiopia's import demand model. His study ignored the effect of forein exchange reserves. The few studies on imports in Kenya include Mairura and Swammy (2015), Mwega (1993), and Muluvi, et. al, (2014). Among them all, there is no general consesus on determinants of imports. There is also need to use more recent data in the wake of the surge in imports especially from China. Therefore, the study went a long way in bridging the literature gap and international trade scholars and researchers will find the study informative and it will form the basis for further research in the area.

Lastly, although the study is based on Kenya, it has wider application to most Sub-Saharan African countries and indeed other developing countries of the world which are grappling with rapidly increasing imports. Therefore, policy makers in such countries will find the results of this study useful in formulating their policies to manage imports in their respective nations. These expositions therefore justified the importance of this study.

1.7 Scope of the Study

The scope of this study was limited to Kenya. The study examined the determinants of aggregate imports in Kenya for the period between 1980 and 2017. The explanatory variables considered in the study were import price index, domestic price index, real income, exchange rate and real foreign reserves. Aggregate imports were the explained

variable. The study used annual time series from 1980 to 2017. The period of the study was based on the period starting in 1980 when Kenya's imports started to increase tremendously (as indicated in figure 1.1) and on availability of data. The length of the period under study was based on the need to provide a robust and statistically relevant evidence. Data for real imports, domestic price index and real foreign reserves were sourced from the Kenya National Bureau of Statistics economic review survey reports. Data for the exchange rate was derived from Central Bank of Kenya statistics while real national income data was derived from World Bank Development Indicators (WDI) from the official website of World Bank.

1.8 Limitation of the Study

The study was limited to the unit of analysis which is Kenya. The lack of a definite price index for imports was also a limitation to the study. However, this was overcame by using the import unit value index as an appropriate proxy for import prices.

1.9 Organization of the Study

The paper is organized into four chapters. Chapter one gives the introduction, the problem under study, objectives of the study, hypotheses to be tested, justification of the study, scope of the study and limitation of the study. Chapter two gives background information of Kenya's trade policy with emphasis on import policies followed by a conceptual framework and an extensive review of both theoretical and empirical literature. Chapter three provides the methodology of the study which includes the theoretical and empirical model. Chapter four presents the results of the study, whereas chapter five provides a discussion of the results, policy recommendations and conclusions.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter describes literature pertaining to the ideas that the study dealt with. The chapter starts with a brief review of theoretical literature on determinants of imports. This is followed by review of the relevant empirical studies import demand.

2.2 Theoretical Literature Review

There exists no universal theory on determinants of imports. Instead, the theoretical literature is choked with an array of hypotheses. These are; the Neoclassical trade theory of comparative advantage, the Keynesian import demand multiplier, the traditional (benchmark) import model, the import-exchange model and the monetarist model (Harvey & Sedegah, 2011). Further, these models can either be looked at as perfect or imperfect substitute's models.

2.2.1 The Neoclassic trade theory of Comparative advantage

The neoclassic trade theory of comparative advantage is embedded in the Heckscher–Ohlin framework. The underpinning principle of the theory is that the volume and direction of international trade are affected by changes in relative prices, which are explained by differences in factor endowments between countries (Murphy, 2013). The theory ignores the effects of changes in national income on trade as the level of employment is assumed to be fixed and output is assumed to be always on a given production frontier

2.2.2 The Keynesian import demand model

The Keynesian import demand function is based on macroeconomic multiplier analysis. The theory assumes that relative prices are rigid and employment level is variable. The

thrust of this framework is the relationship between income and import demand at the aggregate level. The relationship can be defined by the marginal propensity to import, the average propensity to import and the income elasticity of imports (Keynes, 1936). According to the theory, aggregate imports are a positive function of national income.

2.2.3 The new trade theory

Also known as the imperfect competition theory of trade, this theory focuses on intra-industry trade, a concept that is not well explained by the theory of comparative advantage (Krugman, 1979). The new trade theory explains the effects of economies of scale, product differentiation, and monopolistic competition on international trade. The theory suggests a new link between trade and income although the role of income in determining imports goes beyond that defined in both the neoclassic and in the Keynesian import demand functions, where income only affects purchasing power.

2.2.4 The Benchmark Import Model

This model suggests an analysis of import demand relations based on the consumer theory of demand which states that the consumer has the objective of maximizing satisfaction by allocating her income among competing goods. The model postulates that an aggregate import demand equation relates the real quantity of imports demanded by a country to the ratio of import prices to domestic prices (assuming a degree of substitutability between imports and domestic goods) and to domestic real income, all in period t (Arize & Afifi, 1987). It is simply a combination of the ideas in the neoclassical and Keynesian import demand theory since it considers imports as a function of income and prices. Leading work on this model was done by Khan (1974). According to him, the import model is expressed as:

$$M_t^d = f(Y_t, PM_t, PD_t) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 2.1$$

Where; M_t^d is the quantity or volume demanded of imports, Y_t is the real gross domestic product, PM_t is the price of the import commodities, while PD_t is the price of the domestic commodities

The strength of the benchmark model lies in its simplicity and intuitive appeal (Harvey & Sedegah, 2011). The model implicitly assumes the absence of binding import quota restrictions and the income variable can be used to approximate the role of expenditure (domestic absorption). However, it does not capture the impact of import quotas. Quantitative restrictions affect the magnitude of both price and income elasticity of import demand, as well as import levels (Bertola and Faini, 1991).

This model, being too simplistic, is not appropriate to most developing countries as these economies and indeed developed countries as well have enforced trade restrictions on imports since time immemorial. This limitation led to the proposition of the import-exchange framework.

2.2.5 The Import Exchange Model (Hemphill Model)

This model explicitly introduces foreign exchange constraints to the import demand model. In his study, Hemphill (1974) developed the stock adjustment import-exchange equation that has its foundation in the theory of balance of payments. Using information from eight low income countries, the result from the study indicated general compliance with the a priori theoretical relationship between aggregate import trade and foreign exchange revenue. The study therefore laid credence to the position that revenue from foreign exchange transactions is a principal variable influencing demand for aggregate imports demand in low income countries. In the model, the lagged level of international reserves and foreign exchange receipts in real terms are the principal determinants of import demand. The justification for the relationship is usually that demand for foreign

exchange exceeds supply at the existing exchange rate, and that the stock of reserves is small. The framework was extended by Winters and Yu (1985) and Moran (1989). Mirakhor and Montiel, (1987) note that the development of the framework attests to the inability of the traditional framework to explain the slowdown in imports of developing countries who are short in foreign exchange.

According to Hemphill, import demand function is expressed as

$$m_t = f(f_t, r_{t-1}, m_{t-1}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots . 2.2$$

Where m_t, f_t, r_{t-1} and m_{t-1} are the current volume of imports, the real level of foreign exchange receipts, lagged level of international reserves and lagged level of imports respectively.

The model ignores relative prices and domestic income. Hemphill justified this omission by arguing that developing countries generally exhibit excess demand for foreign exchange and that measured import prices (estimated mostly with foreign supplier's data) will not reflect the true scarcity price of foreign exchange. Introducing the two would amount to double counting. This implies that changes in the real exchange rate or cyclical variations in in income do not affect imports directly, but do only through their effect on foreign exchange earnings.

However, empirical findings have shown that relative prices and domestic income are significant determinants of imports especially in developing countries. Case in point is Harvey and Sedegah, (2011).

2.2.6 The Monetarist Approach

Motivated by the exclusion of money market variables in the previous import demand models, Ozo-Eson (1984) introduced the state of equilibrium in the money market as a major determinant of import demand. He derived a reduced form model of import

demand, with the distributed lag of money supply as an argument, by assuming a partial adjustment mechanism for demand for real money balances. According to the monetarist approach, pure income elasticity of import demand is the sum of the income elasticity suggested by the traditional framework and the income elasticity of money demand. This implies that the traditional model of import demand underestimates the pure income elasticity of import demand. Similarly, the appropriate specification of the import function is the one suggested by the reduced form model of the monetarists' framework. A reduction in money supply is likely to reduce aggregate import in any economy, as suggested by the policy implications in the framework.

2.3 Empirical Literature

A vast body of empirical literature exists on the study of determinants of import demand for both developed and developing countries. This explains the vital role that imports play in foreign trade and economic development. However, it is unfortunate that in Kenya, only scanty empirical literature exists to explain import behavior.

The study by Mwega (1993) is by far the most comprehensive attempt to analyze the determinants of Kenya's imports. He investigated the short run dynamic import function in Kenya using an error correction model annual data for the period 1964-1991. Findings of the study indicate that import demand exhibited low elasticity with respect to relative price and real GDP. However, aggregate imports were strongly responsive to lagged forex reserves and forex earnings. The study concluded that foreign reserves were the main determinant of imports. The relevance of Mwega's study on the behavior of Kenya's imports cannot be overemphasized. Indeed, to the best of our knowledge, this is the first ever organized study on imports in Kenya.

In Turkey, Cevik, S. (2001) estimated an econometric model for the country's import demand, founded on the on the "imperfect substitutes" model of Goldstein and Khan (1985). He used GDP to represent income and Real Effective Exchange Rate (REER) to represent relative price ratio in his model. The study employed error correction modeling (ECM) to investigate the dynamic behavior of the model. It was found that real import was positively related to its own first lag and negatively related to gross domestic income and to real effective exchange rate. The short run elasticity of import demand with respect to income was smaller than the long run elasticity, whereas the short-run elasticity of imports with respect to real effective exchange rate was found to be greater than the long run elasticity. The study went ahead to disaggregate Turkey's imports into capital goods imports and consumer goods imports. Imports of capital goods were positively related to gross domestic income and negatively related to real effective exchange rate. The gross domestic income had both current and one period lag effect on capital goods import with short run elasticities being higher for the current period while the real effective exchange rate was found to have two period lag effect on capital goods. The model for consumer goods imports indicated that consumption goods imports were positively related with its own first and second lag and with gross domestic income and negatively related with real effective exchange rate. Short run elasticity of consumption goods imports with respect to income was higher than elasticity with respect to real effective exchange rate is. Both income and real effective exchange rate elasticities were smaller in the short run than its long run elasticities.

Using ECM, Nyoni (2004) estimated a dynamic aggregate import demand function. The study considered GDP, price of imports, foreign reserves and foreign exchange earnings as the independent variables. Their results show that GDP, foreign reserves and foreign exchange earnings were statistically significant determinants of import

demand in Tanzania. GDP was however, the main the most important variable determining demand for imports in Tanzania. Import prices did not significantly affect the county's imports.

In another study, Dutta and Ahmed (2006) investigated the behavior of Indian aggregate imports during the period 1971-1995 using cointegration and error correction modeling and using the imperfect substitute model. They argued that import price and real income (GDP) variables were crucial determinants of imports, because the effectiveness of an import trade policy is highly dependent upon the size of their elasticities. Further they noted that the challenge was to capture the domestic price since data on the price of domestically produced substitutes were not available. They used a dummy variable to capture the effect of import liberalization policy on the volume of imports. Their findings indicated that India's import demand was largely explained by real GDP. They also found that demand for imports was less sensitive to import price changes implying that change of import tariffs and imposition of nontariff barriers could not lead to proportionate changes in imports. The coefficient estimate for the dummy variable indicated little effect of import liberalization policy on aggregate import volume.

Otoro (2008) analysed the determinants of aggregate imports of Ethiopia using cointegretion analysis. Like most other studies on imports, he took real imports as a positive function of a country's GDP since imports were normal in consumption. Further, the study used relative prices(ratio of import prices to domestic prices) as the second main determinant of Ethoipia's imports. Like Dutta and Ahmed (2006), Cevik (2001), Otoro's study was based on the imprefect subsitutes model. The study also assumed that Ethoipias imports were a very small proportion of the total world's imports. This implied that the world's supply of imports to the country were perfectly elastic thereby reducing the model to a single eqation model. The study followed

Moran's (1989) general import model in analyzing the import demand of Ethiopia, only that Otoro used REER (real effective exchange rate) in instead of foreign exchange receipts and reserves and the study also intriduced a dummy variable to capture the different economic regimes, from command economy (1974-1991) to market economy (1991 onwards). Using cointegration analysis and error correction modelling, they found that the in the long run, aggregate import of Ethiopia was mostly affected by real effective exchange rate, followed by real GDP then relative price. On the other hand most of the short run coefficients were insignificant. The policy dummy (trade liberalization) coefficient carried an unexpected sign, and was insignificant. The coefficient of the real effective exchange rate on import was unexpectedly negative meaning that depreciation (appreciation) of the domestic currency would increase (decrease) aggregate import demand. This contardicted theory.

In Cote d'Ivoire, Yue and Constant (2010) examinesd a disaggregated import demand model using time series data for the period 1970-2007. They used the Autoregressive Distributed Lag (ARDL) modeling process to capture the effect of final consumption expenditure, the investment expenditure, the export expenditure and relative prices on import demand. Their findings indicate that a long run cointegration relationship existed between the variables. Furthermore they found that investment and exports are the main determinants of Cote d'Ivoire's imports. However in the short run both of the components of expenditures were significant determinants of import demand. Import demand is not sensitive to price changes.

In their study of the structure and behavior of Ghana's imports, Harvey and Sedegah (2011) used cointegration and error correction modeling. Their basic determinants of aggregate import demand were relative prices and real domestic income (GDP). According to them, trade restrictions that suppress national imports below demand can

be explained by foreign exchange availability. Therefore, they introduced foreign exchange receipts from exports as an additional explanatory variable to the traditional import demand model. They also included a trade openness index, lagged import volume and lagged foreign assets held by monetary authorities as explanatory variables. The study further disaggregated total import demand into four components; Import of food and live animals, minerals, fuels, lubricants and related materials, machinery and transport equipment; and manufactured goods, classified chiefly by material with the same explanatory variables for each of the components. They found that income, real effective exchange rate, foreign exchange reserves and trade openness, did not explain changes in the import of food and live animals and minerals, fuels, lubricants and related materials in the long run, but only in the short run. Furthermore, imports of minerals, fuels, lubricants and related materials were not affected the level of macroeconomic activity. Real effective exchange rate was not a significant determinant of import demand for machinery and transport equipment while income, foreign exchange reserves and trade openness were. Conversely, the level of aggregate import was found to be determined by all the macroeconomic variables in the long run, except the real effective exchange rate.

In Pakistan; Chani et. al. (2011) used the imperfect substitutes model to derive the aggregate import demand function based on disaggregated expenditure components. Their import demand function considered the sum of household and government consumption expenditure, total investment, expenditure on exports of goods and services and the ratio of the import prices to the domestic prices in time as the determinants of imports. Their findings indicated that all expenditure components (consumption expenditure, total investment expenditure, exports of goods and services) had statistically significant impact on import demand in Pakistan while the impact of

relative prices on import demand was negative and not significant in long run. In the short run; consumption expenditure, total investment expenditure, exports of goods and services were found to have a statistically significant effect on import demand while the impact of relative price was statistically insignificant. They concluded that the positive and significant import demand elasticities with respect to all components of final expenditure indicated that increase in economic growth would lead to higher import demand in Pakistan as indicated by the Keynesian absorption theory.

In another study in Kenya, Muluvi et al. (2014) assessed the import structure and relationship between imports and economic growth in Kenya. The study sought to find out the effect of real GDP, foreign reserves, real exchange rate, FDI net inflows and trade openness on imports in Kenya for a perod from 1975 to 2011. The study found that that in the long run, a relationship exists between real imports and real GDP, real exchange rate, trade openness and foreign reserves. Granger causality test showed a unidirectional causality from real GDP to real imports, that is, real GDP Granger causes real imports, but real imports do not Granger cause real GDP.

Mairura and Swammy (2015) estimated an aggregate import demand function for the COMESA region using times series data for the period 1970-2006. They employed bounds testing approach and Autoregressive Distributed Lag (ARDL) modeling to capture the effect of GDP, price of imports, prices of domestically produced goods, foreign exchange reserves and import liberalization on the aggregate import demand quantity. They also assumed that the world's supply of imports to COMESA was perfectly elastic thereby restricting them to the single equation model of an import demand function specified in log-log form. Unlike Harvey and Sedegah (2011), Mairura and Swammy (2015) used two separate price terms that is unit value import price and price index of domestically produced goods to capture the price effects on the quantity

of imports. They relied on the findings in Murray and Ginman (1975) who found that relative price specification in the traditional import demand model is inappropriate for estimating aggregate import demand parameter. They suggested a simple modification of the traditional import demand equation that estimates the effects of imports and import competing prices separately. Urbain (1993) suggested that the use of two separate price terms were preferable to the use of one term. He stated that modeling the dynamics of import demand by using relative prices implies identical dynamic response of imports to changes in import prices and domestic prices. Accordingly, the situation would be difficult to justify, as economic agents use different information sets to form their expectation about domestic and foreign (import) prices. They found that in the long run, gross domestic product, prices of domestically produced goods, unit value of import prices, and Import liberalization are the major determinant of COMESA's aggregate imports demand. GDP was the major determinant and it positively affected COMESA'S imports. In the Short run, GDP was the most crucial determinant of aggregate import demand in COMESA. Domestic price was insignificant in the short run. Foreign exchange reserves positively but insignificantly influenced imports both the long and short runs. Import liberalization was found to have an impact on aggregate import demand.

In Pakistan, Naz, et. al. (2017) sought establish the impact of foreign direct investment (FDI) and imports on Gross domestic product (GDP). With annual data from 1980-2015 using multiple regression analysis to check the relationship among variables, they were able to show the positive effects of foreign direct investment and imports on GDP of Pakistan. They found the coefficient of determination (R^2) to be 0.866 which showed that imports and FDI explain a very significant portion of the country's GDP growth.

The coefficients for FDI and imports were both positive indicating a direct relationship between them and GDP growth.

In addition to the above studies, Myeni (2017) used VECM to estimate import and export demand functions for South Africa and examined evidence for the Orcutt hypothesis in the country's trade flows. The study used impulse response functions based on cointegration and error correction procedure to test the Orcutt hypothesis. The argument behind introduction of the Orcutt hypothesis test was to investigate whether South Africa's trade flows responded to exchange rate changes faster than they respond to relative price changes. According to the study, this would bridge that gap which existed in prevailing literature in which the studies mostly used price and income elasticities as primary determinants of foreign trade but didn't establish which of the two was faster. The results of the cointegrated models indicate that South Africa's trade flows were predominantly influenced by income, relative prices and exchange rates while the results of the generalized impulse response analysis confirmed the existence of Orcutt hypothesis in the South African import demand model and reject it in the case of export demand.

Having been concerned with the rapid increase in imports in Egypt, Ibrahim (2017) sought to examine the merchandise the import demand function for Egypt. The study used OLS and ECM to estimate critical parameters of import demand determinants for the country. Like most other studies on import demand, real GDP and real international reserves were considered as explanatory variables. However, the introduction of inflation rate as a third explanatory variable distinguishes this study from all the others. Empirical results in the study indicate that in both the long run and short run, there was a significant positive relationship between demand for merchandise imports and real GDP, but there was a significant negative relationship between merchandise imports

and real exchange rate. Further, the study found that in the long run, there were significant positive relationships between demand for imports and both inflation and international reserves. However, the relationships were found to be insignificant in the short run.

Mairura (2019) investigated the dynamic behaviour of aggregate imports demand model for COMESA by employing Cointegration tests, namely the Engle-Granger's (EG) residual-based test, Phillips and Hansen's (1990) fully modified OLS (FMOLS), Johansen Juselius (JJ) multivariate cointegration technique and the newly developed bounds testing approach (ARDL) on the annual time series data for 1970 - 2006. They found that a long run relatinship existed among the variables in the import demand model and that aggregate import demand for COMESA is largely determined by real income (GDP) and price of domestically produced goods.

2.4 Overview of the Literature and Literature Gap

The reviewed literature shows that most of the previous studies considered real GDP, foreign reserves, real exchange rate and relative prices as the main determinants of imports. These are Mwega (1993), Cevik, S. (2001), Otoro (2008), Harvey and Sedegah (2011), Mairura and Swammy (2015) and Muluvi et al. (2014). Further, most of them estimated aggregate import demand functions and used Error Correction Modeling (ECM). However, Mairura and Swammy (2015) and Chani, Pervaiz, and Chaidhary (2011) applied the Autoregressive Distributed Lag (ARDL) bounds testing procedure before estimating the import demand functions. Though well thought, the study by Naz et.al. (2017) is deficient of in-depth econometric analysis; the methodology used is too simplistic. Important econometric tests such as stationarity were ignored.

The contribution of Ibrahim (2017) to literature on determinants of imports especially in African economies is vital. One only needs to apply some of his tools of analysis in the Kenyan context to estimate Kenya's import demand function. However, it is worth noting that by estimating only an aggregate import demand model for Africa, the study leaves room for making blanket conclusions and hence inappropriate policy actions since one would expect that these countries' imports are not homogeneous both in terms of nature of goods and in some cases the origin.

By analyzing the determinants of imports for COMESA, Mairura & Swammy (2015) and Mairura (2019) come close to estimating an appropriate model that can be used to determine Kenya's imports since Kenya is a major economic player in the COMESA region. There is only need to narrow down the analysis to the Kenyan case. Further, there's need to capture the effect exchange rates on the country's imports.

A few studies have been done on Kenya's imports. This literature review identifies Mwega (1993) and Muluvi et.al (2014) only. While Mwega (1993) considered real GDP, foreign reserves, real exchange rate and relative prices as the determinants of imports, Muluvi et.al. (2014) did not consider relative prices but trade openness. The study by Mwega (1993) can be considered a more comprehensive study on import demand in Kenya only that a significant amount of time has lapsed since it was conducted meaning there's need to re-examine the determinants in light of the developments of the last decade and recent economic conditions. Further, the study only analyzes the short run imports demand function for Kenya. These are the main gaps that this review identifies in literature. In addition, the above review of literature indicates very few studies for Kenya. This magnifies the literature gap.

In summary, the review of empirical literature identified; lack of sufficient studies on imports in Kenya, the lack of enough more recent studies on imports using recent/latest data, omission of important explanatory variables in the import demand model for Kenya especially import prices and domestic prices (as separate variables), and the fact that none of studies on imports in Kenya used the ARDL bounds testing approach as the main gaps. This study addressed these gaps by introducing import prices as well as prices of domestic goods in the import demand model. The study also used more recent data from 1980-2017 meaning the study captured the most recent dynamics. Further, the econometric methodology employed ensured that results obtained in the study are reliable

2.5 Conceptual Framework

A conceptual framework is a brief description of the phenomena under study accompanied by a pictorial presentation of the major variables of the study to show the relationships between the dependent variable and independent variables. (Serem et al., 2013). It is the structure of variables that the study operationalizes, informed by both theoretical and empirical literature as well as the study objectives. In this study, a review of both theoretical literature and empirical literature revealed that the main determinants of imports in general are real GDP, relative prices, real foreign reserves and the effective exchange rate. This is largely based on the traditional and Hemphill import demand theories. Therefore, this study proposed the conceptual framework in figure 2.1 to bring out the relationship between the independent variables (being the determinants); real GDP, import price index, domestic price index, real foreign reserves, the effective exchange rate and the dependent variable; imports.

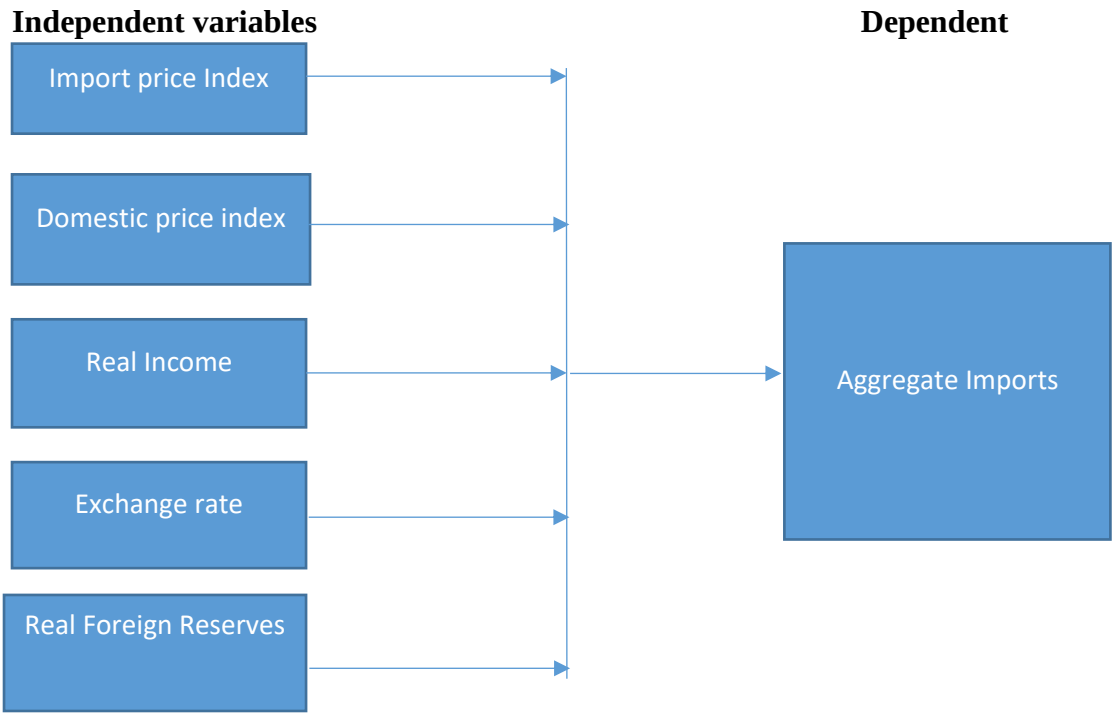

Figure 2.1: Conceptual framework for determinants of imports
Source: Author, (2020).

2.6 Operationalization of the Variables in the Conceptual Framework

Domestic Price Index-*DPI*

Domestic price index was the proxy for price of substitutes (locally produced goods and services). In addition to own price, the demand for any commodity is also determined by price of related commodities. Since imports are considered as substitutes to domestically produced commodities, the price of domestically produced commodities can be taken theoretically as a determinant of imports into the country. According to demand theory, rise in price of a substitute leads to a rise in demand for the commodity.

Data for this variable was compiled from the consumer price indices (CPI) published by the Kenya National Bureau of Statistics.

Exchange Rate-*ER*

The study used official exchange rate which is defined as the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar). It was calculated as an annual average based on monthly averages and was stated as a ratio of KES to USD 1.00. The data was obtained from the Central Bank of Kenya (CBK) data pool.

Exchange rate has been traditionally linked with import prices. Recent empirical literature has however disputed this fact. For instance, Jabara (2009), noted that in some cases, there is an "incomplete" pass-through of exchange rates to import prices. This argument informs the inclusion of exchange rate as separate independent variable. The idea is to find out if the exchange rates variations are passed through into the product prices or they are absorbed into producer profit margins (Krugman P. , 1987).

Import Price Index-*IPI*

The import price index was the proxy for price of imported goods. According to demand theory, the demand for any commodity is largely explained by changes in own price as well as price of related (substitute) commodities. For a normal good, a rise in own price leads to fall in demand. In the conceptual framework, the relationship between price index of imported commodities was entirely based on the demand theory. The study assumed that imports and domestically produced goods are not perfect substitutes.

The study used the import unit value index from World Bank data.

Real Foreign Reserves-*RFR*

Total reserves comprise holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of

monetary authorities. The gold component of these reserves is valued at year-end (December 31) London prices. The data was obtained from world development indicators in current USD and expressed in KES using the prevailing year's exchange rate.

In international trade, foreign currency is often an indispensable requirement to finance imports of goods and services. Foreign reserves play the role of an international liquidity constraint and any increase in reserves should thus have a positive impact on import demand. Therefore, the conceptual framework proposes that the level of foreign reserves will directly affect imports into the country.

Real imports-*RIMP*

Imports comprise of the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments. Imports was the dependent variable in the study. The data was in constant Kenyan shillings and was sourced from the Kenya National Bureau of Statistics economic surveys.

Real income-*RINC*

The proxy for income was Gross Domestic Product (GDP). GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of

natural resources. Data was in constant local currency and it was obtained from the World Bank's World Development indicators.

The relationship between income and imports is explained by the Keynesian import multiplier theory. The link between imports and income is defined by the marginal propensity to import, the average propensity to import and the income elasticity of imports (Keynes, 1936). A rise in national income causes a rise in purchasing power which leads to higher demand for imports. However, if the rise in real income is due to an increase in production of import substitutes goods, imports may decline as income increases.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the methodology that was used to measure, collect, and analyze data. It outlines the study area, the research philosophical view, research design, target population of the study and the data collection procedure. It also outlines the theoretical framework, econometric model as well as the post estimation diagnostic tests. In a nutshell, this chapter idealizes the conceptual framework into the study.

3.2 Research Philosophy

A research philosophy is a system of beliefs or framework that guides a research. It is a concerned with the ways in which data or information about a phenomenon of interest should be collected, analyzed, and interpreted. The four main research philosophical views that can be applied in business and economics are pragmatism, positivism, realism and interpretivism. The pragmatic philosophy is characterized by mixed or multiple methods both qualitative and quantitative while research positivism involves a highly structured methodology with quantitative measurement of variables involving large samples. On the other hand, research realism requires that methods chosen must fit the subject matter whether quantitative or qualitative while interpretivism philosophy is characterized by in-depth investigations of small samples and is majorly qualitative (Saunders et. al., 2012).

This study involved statistical analysis of secondary data to establish the relationship between Kenya's aggregate real imports and Import Price Index, Domestic Price Index, real income, Exchange rate and Real Foreign Reserves. For each explanatory variable, Hypothesis was tested in a structured quantitative way using a sufficient sample size with annual observations from 1980 to 2017. The researcher was always independent

of the study and sought to establish the nature of the relationships among the variables in an objective and measurable way. The data was collected objectively and analyzed scientifically. The relationship between aggregate imports and its determinants in Kenya was also established using econometric methods. All these procedures indicate that the research was conducted in a structured way consistent with the positivist research philosophy. Therefore, the study was suitably underpinned in the tradition of positivism research philosophy.

3.3 Research Design

A research design is a framewwork which outlines the methods and procedures for data collection and analysis for purposes ascertaining study hypotheses. It provides a framework for the collection, measurement and analysis of data in order to enable the researcher attain the study obejctives. Research designs range from experimental design, longitudinal design, case study design, cross-sectional design, correlation design or explanatory design (John , 2018). In order to explain the relationship between the aggregate imports in Kenya and its determinants (Import Price Index, Domestic Price Index, real income, exchange rate and Real Foreign Reserves), this study used the explanatory research design. This design is useful in explaining what is observed by descriptive studies (Cooper & Schindler, 2008). Furthermore, according to Shmueli (2010), explanatory research design enables the use of statistical methods to establish and explain whether there exists a relationship between the variables. The study therefore explains rather than simply describing the relationship between the variables. This design also enables the testing of research hypotheses.

3.4 Unit of Analysis

Unit of analysis is the person or object from which the researcher collects data. It answers the question of ‘what’ and/or ‘who’ is being studied in a research. It is the

whole unit being researched. It can be individuals, groups of individuals, organizations of individuals, a country or countries, technologies and objects that are the objective of the study (Kumar, 2018). According to him, the unit of analysis depends on the research problem and therefore, once a research problem is identified, a researcher will have to identify the unit of analysis as a part of the process of defining the research problem and deciding the methodology of the research work. The unit of analysis for this study was Kenya. Data for Kenya's aggregate imports, Import Price Index, Domestic Price Index, real income, Exchange Rate and the Real Foreign Reserves was used to achieve the study objectives of establishing the determinants of aggregate imports in Kenya.

3.5 Target Population

According to Sekaran (2010), target population refers to the entire group of objects of interest with common characteristics that researcher intends to study. The study sought to establish the determinants of aggregate imports in Kenya. As such, it targeted Kenya's aggregate imports as the dependent variable and Import Price Index, Domestic Price Index, real income, Exchange Rate, and the Real Foreign Reserves as the independent variables. The target was annual observations of each of these variables.

3.6 Data Collection Procedure

Data collection procedure refers the sequence of activities that the researcher carries out to collect data using the chosen data collection instrument. The procedure entails establishment of the sampling design and data collection instrument, identification of the data sources, and laying down the entire research procedure for the study. This section describes the data collection procedure that was used in the study.

3.6.1 Sampling design

In order to collect complete, accurate and reliable data on the variables of the study, the study reviewed several online data bases; COMESA Statistics (COMSTAT), UNCTAD data, World Bank data pool, Central Bank of Kenya data, National treasury, KNBS, State department for trade, the export promotion council and WTO. These data bases were conveniently selected because the organizations that run them are involved in one way or the other in international trade. From these sources, World Bank data pool, Central Bank of Kenya and the KNBS were further conveniently selected because they presented adequate and complete data on the specific variables on the study. The sources were also convenient because of availability on online databases, ease of access and retrieval and credibility of the data. Data from 1980-2017 was considered adequate since 38 annual observations would permit proper inference using time series econometrics.

3.6.2 Data sources

The two main sources of data for research are primary data source and secondary data source. According to Kabir (2016), primary data refers to data that is collected from firsthand experience and has not been published yet while secondary data is data collected from sources that have already been published. This study used secondary data sources because of the ease of availability of data on the variables under study from secondary sources. Furthermore, secondary data was cost effective and convenient for this study. The data were time series, and the frequency of the data was annual (see appendix 3). Data for aggregate real imports, Domestic Price Index and Real Foreign Reserves were sourced from the Kenya National Bureau of Statistics economic review survey reports. Data for the Exchange Rate was derived from Central Bank of Kenya

statistics while real national income data was derived from World Bank development indicators.

3.6.3 Data collection Instrument

Data collection instrument is the research tool used to collect data for the study from the identified sources. This study developed a data collection spreadsheet using Microsoft Excel application to consolidate and organize the study data. A spreadsheet was considered convenient since data generated from World Bank and CBK website was already organized in excel format. Data from the KNBS economic survey reports was easily added to the excel sheet by introducing additional columns and manually keying in the data.

3.6.4 Measurement of Variables

This study sought to establish the determinants of aggregate imports in Kenya. Therefore, Kenya's aggregate imports was the dependent variable. The review of literature established that the main factors that can be considered as determinants of import demand for any economy are relative prices (prices of imports and prices of domestically produced good), income of the economy, exchange rates and foreign reserves. Therefore, this study considered Import Price Index, Domestic Price Index, real Income (GDP), exchange rate of the Kenyan Shilling to the United States Dollar and Real foreign reserves as the independent variables. This section describes how the data on the variables was be measured.

The dependent variable for the study was real aggregate imports of Kenya (RIMP). This variable was measured in constant Kenyan shillings and was sourced from the Kenya National Bureau of Statistics economic surveys. The study used the import unit value index from World Bank data as the Import price index. The index is measured as a

percentage. Similarly, the domestic price index was a percentage being the Consumer Price Index. Real income was the country's GDP measured in constant Kenya shillings while exchange rate was the annual average rate of the KSh. against the US dollar. Real foreign reserves were constant Ksh.

3.7 Data Analysis and presentation tools

This section details and justifies the data analysis and presentation tools that were used in the study. The study data was analyzed using E-views 9 software due to availability and ease in running ARDL models. As part of quality assurance, recorded values for all variables were reviewed for completeness.

3.7.1 Descriptive analysis of the data

The first step in analysis of the data was carrying out a descriptive analysis of the data on all the variables under study in order to provide a general view on the distribution, trends and or changes on data sets over time for the period of analysis. The procedure involved computation of measures of central tendency (mean and median), measures of spread (minimum, maximum, and standard deviation), and a measure of skewness and peakedness of the distribution. The measures of central tendency summarized the data using a single average while the measures of spread served to indicate the extent of dispersion of the data on the variables under study. On the other hand the measure of skewness was meant to establish the degree of symmetry or departure from it in the distributions.

Of greatest importance among the descriptive statistics was the Jacque-Bera (JB) statistic. This statistic was used to test for normality properties of the data on all the variables. The statistic was used to carry out the JB test of normality which is a goodness of fit test for establishing whether sample data have the skewness and kurtosis

matching a normal distribution. The relevance of this test was to ascertain whether the assumption of normality of distribution is met. According to Judge et. al. (2007), normality can be tested using the Jarque Bera test, Kolmogorov's test and Andersson Darling test. The Jarque Bera test for normality was preferred because; it is an omnibus test that detects departures from normality due to both skewness and kurtosis, it has optimum power properties when the alternatives to the normal are members of several important families of distribution and it is biased in favor of the null hypothesis. Further, the test is simple to undertake and interpret. The procedure for the test utilized two statistical properties, that is, skewness of zero and kurtosis of three or excess kurtosis of zero. The null hypothesis of the test stated that the distribution is normal. If the ρ - value is less than 0.05, the null hypothesis is rejected and the conclusion is that the distribution is normal (Jarque & Bera, 1980).

The data was also plotted on graphs to show trends and give an idea about the nature of stationarity of the variables. This was followed by the time series estimation procedures

3.8 Theoretical framework

This study was anchored in the traditional/benchmark model of import demand pioneered by Khan (1974). The thrust of this model is that an aggregate import demand equation relates the real imports demand by a country to the ratio of import prices to domestic prices and domestic real income. In a nutshell, the model considers prices and income as the main determinants of imports. This model was selected because of its simplicity. The same theoretical model has been used by other researchers such as Murray and Ginman (1975), Mwega (1993) Mairura and Swammy (2015) and Mairura (2019). The basic import demand model was therefore specified as follows.

$$RIMP_t^d = f(IPI_t, DPI_t, RINC_t) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .3.1$$

This model was augmented by introducing other variables that may affect Kenya's imports. Exchange rate (ER) and real foreign reserves (RFR) were confirmed as additional explanatory variables in the model following Moran (1988) and Harvey and Sedegah (2011). Therefore, the import demand function was restated as follows.

$$IMP = f(IPI, DPI, RINC, ER, RFR, \mu) \quad \ldots\ldots\ldots \qquad 3.2$$

Where IMP is the volume of imports, IPI is the import price index, DPI is the domestic price index, $RINC$ is the real income, ER is the exchange rate, RFR is the real foreign reserves while μ is the error term to capture the effect of omitted variables.

The model in 3.1 is appropriate and complete import demand model for Kenya since it accounts for the traditional determinants of import demand (price and income) as well as foreign exchange constraints. Instead of using the variable relative price, the study broke it down into import price index (IPI) and domestic price index (DPI) following Mairura and Swammy (2015).

3.9 Model specification

The import demand function in 3.1can be stated in econometric terms as follows.

$$RIMP_t = b_0 + b_1 IPI_t + b_2 DPI_t + b_3 RINC_t + b_4 ER_t + b_5 RFR_t + \mu_t \quad \ldots\ldots\ldots\ldots 3.3$$

The constant term "b_0 " was included because there would be some imports even if all other variables are zero. It is expected that, *Ceteris Paribus*, an increase in the price of imports is expected to lead to a reduction in the demand for imports so that $b_1 < 0$. The coefficient b_2 is expected to be positive since a rise in price of domestically produced goods leads to a rise in demand for imports. The coefficient of $RINC$, is the marginal propensity to import; the fraction of any additional income that is spent on imports and must lie between zero and one, that is $0 < b_1 < 1$. An increase in domestic income is expected to lead to an increase in the demand for imports but not as much, in

proportionate terms. It also expected that a depreciation in the exchange rate makes imports expensive to domestic consumers and consequently reduces their demand for imports, hence $b_4 < 0$. The parameter b_5 shows how imports vary with changes in foreign reserves. It is expected that an increase in total foreign reserves, all things being equal, will lead to an increase in the domestic demand for foreign goods so that $b_5 > 0$.

The error term is assumed to be randomly and normally distributed with constant variance expressed as $\mu \sim N(0, \sigma_\mu^2)$.

The logarithmic expression of equation 3.3 is shown in equation 3.4. Logarithmic transformation is necessary to linearize the model. Moran (1988) states that log specification also simplifies the interpretation of the estimated coefficients as elasticities. Furthermore, previous empirical studies used the model in logarithm form.

$$lnRIMP_t = b_0 + b_1 lnIPI_t + b_2 lnDPI_t + b_3 lnRINC_t + b_4 lnER_t + b_5 lnRFR_t + \mu_t \quad \ldots\ldots 3.4$$

3.10 Time Series Estimation Issues

3.10.1 Cointegration

Co-integration makes it possible to retrieve the relevant long run information on the relationship between the considered variables (Misorimaligayo, 2017). The concept was initially developed by Engle and Granger (1987). Later on it was extended by Stock and Watson (1988), Johansen (1988, 1991), Johansen and Juselius (1990) and Pesaran and Shin (1999) and Pesaran et al. (2001). This study used the bound testing approach to cointegration, within an Auto-Regressive Distributed Lag (ARDL) framework, developed by Pesaran and Shin (1999) and Pesaran et al. (2001).

A simple ARDL model is given as;

$$Y_t = \delta_0 + \sum_{j=1}^{p} \delta_{0_1 j} Y_{t-j} + \sum_{j=0}^{q} \delta_{1j} X_{t-j} + \mathcal{E}_t \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5)$$

Incorporating the short run and long run dynamics, equation (3.4) is transformed into bound testing approach as;

$$\Delta Y_t = \beta_0 + \sum_{j=1}^{p} \beta_{1j} \Delta Y_{t-j} + \sum_{j=0}^{q} \alpha_{1j} \Delta X_{t-j} + \theta_0 Y_{t-1} + \theta_1 X_{t-1} + \mathcal{E}_t \ \ldots\ldots\ldots (3.6)$$

In this framework, the dependent variable is explained by lagged values of itself, current and lagged values of independent variables. The method has several advantages; first, the method is applicable where the regressors are $I(0)$, $I(1)$ or mutually co-integrated. Secondly, it's relatively more efficient in small or finite sample data sizes. Thirdly, it allows the co-integration relationship to be estimated by OLS once the lag order of the model is identified, and lastly a dynamic unrestricted error correction model (UECM) can be derived from the ARDL bounds testing model through a simple linear re-parametrization. Re-parametrization is possible because the ARDL is a dynamic single equation model and of the same form with the ECM. Distributed lag model simply implies the inclusion of unrestricted lag of the regressors in a regression function. Therefore, the UECM combines the short run dynamics with the long run equilibrium without losing any long run information. However, none of the variables should be integrated of order two I(2).

3.10.2 Unit root test

ARDL assumes that variables are either I(0) or I(1) implying that its not compulsory to conduct the unit root test as a pretest. However, Misorimaligayo (2017) stresses that it is necessary to conduct unit root tests because ARDL bounds test approach fails if any of the variables turn out to be I(2). The major consequence of non-stationarity in

regression analysis is spurious correlation that inflates R squared and the t-scores of the non-stationary independent variables, which in turn leads to incorrect model specification otherwise called type 1 error. It means the regression results will look good, but they will be devoid of econometric interpretation. To arrive at a robust conclusion about the stationarity of the time series, the study conducted both the Augmented Dickey Fuller (ADF) test and the Phillips and Perron test (PP) (Phillips and Perron, 1988).

The model and hypotheses for unit root with drift and trend is presented as follows

$$\Delta Y_t = \emptyset_0 + \beta_t + \pi Y_{t-1} + e_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.6$$

Where $\pi = \emptyset_1 - 1$

$H_0: \pi = 0$ Time series is not stationary

$H_0: \pi < 0$ Time series is stationary

The PP test is similar to Augmented Dickey Fuller (ADF) test but it incorporates an automatic correction to the DF procedure to allow for auto-correlated residuals.

Phillips and Perron use nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms (Gujarati, 2004). It is well suited for analyzing time series whose differences may follow mixed autoregressive moving average (p,q) processes of serial correlation and heteroscedasticity.

The process of the PP test started with estimation of the following equation for each variable.

$$y_t = \rho_0 + \rho_1 y_{t-1} + \rho_2 y_{(t-T/2)} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.7$$

Where T is the number of observations and ε_t is the error term. This was followed by test of the following hypothesis.

H_o: $\rho = 1$ There is a unit root

H_1: $\rho < 1$ The is no unit root

3.10.3 Lag length selection

In economics, the dependence of a variable Y on another variable X is rarely instantaneous. Very often Y responds to X with after lapse of time. The time lapsed is called lag. One must be cautious when using lags. This is because too many lags will affect the estimation results by reducing the degrees of freedom, increasing the possibility of multicollinearity, can lead to serial correlation in the error terms and misspecification of errors. There is no hard-and-fist-rule on selection of the lag length. The question of the optimal lag length is therefore an empirical issue. This study used the Akaike Information Criterion (AIC) to establish the optimal lag length.

3.10.4 ARDL bounds test

The model in 3.5 is specified as follows for cointegration test.

$$\begin{aligned}\Delta lnRIMP_t = {} & \delta_0 + \sum_{i=1}^{n} \delta_{1i}\, \Delta lnRIMP_{t-k} + \sum_{i=0}^{n} \delta_{2i}\, \Delta lnIPI_{t-k} \\ & + \sum_{i=0}^{n} \delta_{3i}\, \Delta lnDPI_{t-k} + \sum_{i=0}^{n} \delta_{4i}\, \Delta lnRINC_{t-k} \\ & + \sum_{i=0}^{n} \delta_{5i}\, \Delta lnER_{t-k} + \sum_{i=0}^{n} \delta_{6i}\, \Delta lnRFR_{t-k} + \beta_1 lnRIMP_{t-1} \\ & + \beta_2 lnIPI_{t-1} + \beta_3 lnDPI_{t-1} + \beta_4 lnRINC_{t-1} + \beta_5 lnER_{t-1} \\ & + \beta_6 lnRFR_{t-1} \\ & + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.8)\end{aligned}$$

Let k be the chosen lag

Where, Δ is the difference operator, IMP are imports, INC is the national income, IPI is the import price index, DPI is the domestic price index, ER is the exchange rate

while FR is the real foreign reserves. ln stands for natural logarithms. The parameters δ_1,δ_2, δ_3, δ_4, δ_5 and δ_6 are the short run dynamic coefficients of the ARDL model while β_1, β_2 , β_3 , β_4, β_5 and β_6 are long run parameters (elasticity's). k is the lag length.

To investigate the presence of a long run relationship, the following hypothesis are tested.

H_0: $\beta_1 = \beta_2 = \beta_3 , = \beta_4 = \beta_5 = \beta_6 = 0$ (coefficients of the long run equation are all equal to zero implying no cointegration)

H_1: : $\beta_1 \neq \beta_2 \neq \beta_3 , \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \delta_0 \neq 0$ (coefficients of the long run equation are not significantly to equal zero implying cointegration exits)

The F-test of the joint significance of the long run coefficients was used to establish the existence of cointegration. Likewise, a t-statistic was also provided to confirm the existence of co-integration and upper and lower critical values were provided and the same criterion of analysis used as in the F-statistic. Pesaran et.al. (2001) provides critical values, upper and lower critical values which will have to be compared with the F-statistic (Wald test) in order to accept or reject the null hypothesis. The lower critical values assume all the variables are I (0) while the upper critical values' assumes all the variables are I(1).

If the F-statistic exceeds the upper critical bound, the null hypothesis is rejected meaning that co-integration exists among the variables, and if the F-statistic is below the lower critical bound; the null hypothesis is accepted indicating absence of long run relationship among the variables. However, if the F-statistic will fall within the band, the result will be inconclusive, otherwise, if all the variables will be I (1) a decision will

be made using the upper critical values, and if all variables will be I (0), a decision will be made using the lower critical values.

From the results of the bounds test, if the variables are be found to be cointegrated, the study would specify both short run (ARDL) and long run (ECM) models. However, if the variables are found not to be cointegrated, only the short run (ARDL) model is specified.

3.10.5 ARDL Error Correction Model

As stated above, if results of the bounds test indicate that the variables are cointegrated, the study would specify both short run (ARDL) and long run (ECM) model. The ARDL model in equation (3.7) is reparameterized into an ECM. The reparameterized result from the ARDL model gives the short run dynamics and long run relationships of the underlying variables. The ECM was represented by the following equation.

$$\Delta lnRIMP_t = \varphi_0 + \sum_{i=1}^{n} \varphi_1 \Delta lnRIMP_{t-k} + \sum_{i=0}^{n} \varphi_2 \Delta lnIPI_{t-k} + \sum_{i=0}^{n} \varphi_3 \Delta lnDPI_{t-k} + \sum_{i=0}^{n} \varphi_4 \Delta lnRINC_{t-k} + \sum_{i=0}^{n} \varphi_5 \Delta lnER_{t-k} + \sum_{i=0}^{n} \varphi_6 \Delta lnRFR_{t-k} + \pi ECT_{it-1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

3.11 Post-Estimation diagnostic tests

3.11.1 Stability test

The estimation procedure cannot be expected to produce good forecasts if the estimated model was only stable over the sample period. The model has to be stable over the foercasting period. If the model's parameters are different during the forecast period than they were during the sample period, then the estimated will not be very useful, regardless of robustenss of the estimation procedure. Further, if the model's parameters are unstable over the sample period, then the model will not be a a good representation

of how the series evolved over the sample period. The importace of the stability of the setimated import demand model has been stressed by Mairura (2019) who stated that the effectivenemss of import (trade) policy depends on the stability of the aggregate import demand function.

The two main approaches to checking for stability are; the cumulative sum (CUSUM), and cumulative sum squares (CUSUMSQ) (Borensztein, et. al., 1998). The structural stability of the aggregate import demand model estimated in this study was tested using the CUSUM test. The test is based on the cumulative sum of the recursive residuals.

3.11.2 Serial correlation test

Often, it occurs in time time-series data that the assumption of zero correlation among error terms is violated. That is $Corr(e_t, e_{t-1} \neq 0$. It means that the error terms are not independently distributed across the observations and are not strictly random. Among the consequences of autocorrelation are; the coefficients remaining unbiased, increased true variance of the estimates of the coefficients, and lower standard errors and high t-statistic values. It also leads to highly exaggerated R^2.

The common tests that can be used to detect presence of autocorrelation are; plotting the graph of the dependent variable against the error term (residual scatter-plot), the Durbin-Watson test and the Breusch Godfrey test. This study used the Breusch Godfrey test for serial correlation. The null hypothesis of the test is that there is no autocorrelation among the residuals. The procedure for the Breusch Godfrey test involves running an OLS regression followed by a regression of the residuals obtained on the explanatory variables and lagged values of the estimated residuals as shown in equation (3.10).

$$u_t = \propto_1 + \propto_2 X_t + \rho_1 \mu_{t-1} + \rho_2 \mu_{t-2} + \cdots + + \rho_p \mu_{t-p} + \varepsilon_t \ldots\ldots\ldots (3.10)$$

In a large sample size,$(n-\rho)R^2 \sim \chi_p^2$, that is, *n-ρ* times R^2 value obtained from equation (3.10) asymptotically follows a chi square distribution with ρ degrees of freedom where ρ is the number of lags. If $(n-\rho)R^2$ is greater than the critical chi square value at a given significance level, the null hypothesis of no serial correlation is rejected.

3.11.3 Heteroscedasticity test

Heteroscedasticity is a violation of one of the assumptions of OLS where the variance of the error term is no longer constant. Given an OLS model as 3.11, the error term is homoscedastic when $Var(\mu/X) = \sigma^2$, otherwise, we have $Var(\mu/X) = \sigma^2 f(X)$ which is the case of heteroscedasticity.

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i \dots\dots\dots (3.11)$$

The presence of heteroscedasticity implies that: OLS estimators and regression predictions based on them remains unbiased, the OLS estimators are no longer the Best Linear Unbiased Estimators (BLUE) because they are no longer efficient meaning that the regression predictions will be inefficient as well and because of the inconsistency of the covariance matrix of the estimated regression coefficients, the tests of hypotheses, (t-test, F-test) are no longer valid (Vynck, 2017).

This study used Breusch–Pagan–Godfrey Test to test for heteroscedasticity. The test involves estimating equation 3.12 after establishing the errors in equation 3.11. The squared residuals are regressed against the independent variables. The null hypothesis of the test is that the residuals have a constant variance that is there is no heteroscedasticity. If $\alpha_2 = \alpha_3 = \alpha_n = 0$, then we say that there is homoscedasticity.

$$\mu_i^2 = \alpha_1 + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \cdots \dots\dots \alpha_n X_{Ki} + v_i \dots\dots\dots\dots (3.12)$$

If the F-statistic from estimation of equation 3.12 is not significant, then the researcher fails to reject H_0 implying that the regression model has not problem of heteroscedasticity. (Gujarati, 2004). A rejection of the null hypothesis implies that there is heteroscedasticity.

3.11.4 Multicollinearity test

In regression analysis it is desirable to have a correlation between the dependent variable and the individual independent variables. However, it is not desirable to have high correlation among the independent variables. According to Daoud (2017), multicollinearity is a situation where two or more predictors are correlated. Multicollinearity regardless of the degree, if it is not perfect, does not break down OLS estimation, that is OLS estimates are still unbiased and BLUE (Best Linear Unbiased Estimators). Therefore, it becomes a major problem only when multicollinearity is perfect. However, it leads to high standard errors of the coefficients, and, by inflating standard errors, multicollinearity makes some variables statistically insignificant when they should be significant. Perfect multicollinearity means that there exists a perfect linear relationship between two independent variables (Gujarati, 2004).

Multicollinearity can be tested by examination of Correlation Matrix of the independent variables, Variance Inflation Factor (VIF) and Eigen system Analysis of Correlation Matrix. In addition to the three, a simpler method of detecting multicollinearity involves observing if the model has too many t-ratios which are insignificant when the overall F-statistic indicates that the model is overally significant. The procedure adopted for testing multicollinearity in this study involved construction of a correlation matrix for all the independent variables under study. A correlation matrix is simply a table showing correlation coefficients between various paired variables. Each cell in the table shows the correlation between two variables.

3.11.5 Ramsey RESET test

There are various choices that can be used in terms of specification of regression models. For example, one can specify a linear model that that is linear in data or linear model that is non-linear in data for instance by adding quadratic terms, or by considering log models. The linear specification is the most common specification in business and economics by far. This is because it is the easiest to estimate and allows the researcher to interpret the coefficients of the independent variables as marginal effects. However, it is necessary to determine if the specification reasonably reflects the data. One of the tests that can be used to confirm that the model reasonably reflects the true data generating process is the Ramsey Regression Specification Error Test (RESET) test. According to Ramsey (1969), the test determines whether there is existence of a nonlinear relationship when the in fact, study has used a linear estimation model that is misspecification of the model.

The procedure of the test involves, estimating a linear regression model of the dependent variables on all the independent variables and determine all the fitted values ($\hat{Y}_i$). All the fitted values are squared and a new regression of the linear model of $\hat{Y}_i$ on all the X_i as well as $\hat{Y}_i^{\,2}$ as an additional explanatory variable is estimated. This summarized by equation 3.14 as follows.

$$Y_i = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k + \delta_1 \hat{Y}_i^{\,2} + \varepsilon \ldots\ldots\ldots (3.14)$$

If the regression model is correctly specified, then $\hat{Y}_i^{\,2}$ will not significantly explain Y_i. It means that the coefficient $\delta_1 = 0$ if the model is correctly specified. If the model is not correctly specified, then $\delta_1 \neq 0$. Therefore, the null hypothesis of the test $\delta_1 = 0$ (model is correctly specified) against the alternative hypothesis of using the t-test $\delta_1 \neq 0$ (model is mis-specified) (Ramsey, 1969).Rejection of the null hypothesis will only

indicate signs of misspecification of the model (particularly non-linearity in the data) but it does not tell exactly what the misspecification is (Ramsey, 1969).

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter details the results of data analysis procedures undertaken during the study, results of the analysis as well as the interpretations made therefrom. It starts with analysis, presentation and interpretation of the descriptive statistics of the variables under study. This is followed by a graphical presentation, analysis and interpretation of the data on all the variables. Thereafter, the chapter provides an analytical presentation on the behavior of aggregate import demand for Kenya using time series data for the period 1980-2017. The analytical process on the aggregate import demand model for the country begins with tests of stationarity using ADF test and PP test to ensure the variables are stationary. Cointegration among the variables was tested using the ARDL bounds testing approach and the optimal lag length selected using the AIC criterion. After establishing the presence of a long run association among the variables, both the short run (ARDL) and long run (ECM) were estimated. The results of both ARDL and ECM models are presented and analyzed in this chapter. Lastly, the chapter also presents the post-estimation test procedures (normality of error term, stability test, heteroscedasticity test, serial correlation test and autocorrelation test) results and interpretations.

4.2 Empirical Results

4.2.1 Descriptive analysis of the data

In this section, the study presents summary statistics of the variables. Descriptive analysis was conducted for the whole sample. The descriptive results are shown in table 4.1.

The mean value summarizes the data using an average of the observations. The table reveals that the mean of all the variables were positive with RINC recording the highest mean of Sh. 2,472,852,611.94. The average domestic price index was lower than the average import price index indicating that on average, prices of domestic goods were lower than prices of imports. The average of aggregate real imports over the period of analysis was Sh. 503,759,071.74. Median was also computed as an additional measure of central tendency. It represents the middle-most value in a distribution. The median real imports value was 326,774,657.55. This means that one half of the observations of annual aggregate real imports of Kenya during the study were below 326,774,657.55 while the remaining half were above this value. Similarly, a half of the observations on import price index between 1980 and 2017 lied below 75.95 percent while half of the observations on domestic price index during the same period lied below 33.69 percent. The same interpretation applies for RINC, ER and RFR.

Table 4.1: Descriptive analysis of the data

	RIMP	IPI	DPI	RINC	ER	RFR
Mean	5.04E+08	78.41974	51.51646	2.47E+09	55.74045	2.04E+08
Median	3.27E+08	75.955	33.69134	2.34E+09	63.84217	1.57E+08
Maximum	1.73E+09	119.08	172.4282	4.51E+09	103.41	5.00E+08
Minimum	22627259	44.95	2.766558	1.61E+09	7.420187	41413789
Std. Dev.	5.04E+08	19.66062	51.27134	7.31E+08	30.51507	1.31E+08
Skewness	0.977857	0.48839	0.973065	1.569366	-0.29145	0.875917
Kurtosis	2.849643	2.450947	2.671477	4.836342	1.658525	2.693952
Jarque-Bera	6.09176	1.987968	6.167636	20.93768	3.387263	5.007435
Probability	0.047554	0.370099	0.045784	0.000028	0.183851	0.000000
Sum	1.91E+10	2979.95	1957.625	9.40E+10	2118.137	7.74E+09
Sum Sq. Dev.	9.39E+18	14301.98	97263.78	1.97E+19	34453.28	6.34E+17
Observations	38	38	38	38	38	38

Source: Author's own computation (2020)

The extreme values (Maximum and Minimum) indicate the spread of the distribution of data for the variables under study. For example, the maximum and minimum real income values for Kenya between 1980 and 2017 were Sh. 1,607,647,645.25 and 4,506,245,477.82 respectively. Similarly, the maximum and minimum values for IPI 119.08 percent and 44.95 percent respectively while the values for DPI were 172.42 percent and 2.77 percent indicating that the DPI was more variable with an absolute range of 169.7. The maximum value of the ER was 103.41 while the minimum value was 7.42 meaning that the strongest the Kenyan shilling has ever been against the USD was KSh. 7.42: USD 1.00 while the weakest it exchange rate was KSh. 103.41: USD 1.00 for the period between 1980 and 2017. Further, the highest level of real foreign reserves held by the country over the period of analysis was 499,899,205.53 while the lowest was 41,413,788.5. The standard deviation is also used to measure the amount of dispersion or spread in the distributions. The standard deviation for imports was KSh.503,677,003.45 indicating that the annual aggregate real import values for Kenya over the period under study were fairly dispersed. The standard deviation for IPI (19.66) was less than the standard deviation for DPI (51.27) indicating that IPI data was more uniform than DPI observations for the period under study.

Skewness and Kurtosis are the measures of normality of the data. Skewness measures the extent of departure from symmetry of a distribution. Normal skewness has a zero (0) skew indicating that the distribution is symmetric around its mean, positive skewness indicates the distribution has a long right tail suggesting more higher values than the sample mean while positive skewness indicates a long left tail suggesting more lower values than the sample mean. It is worth noting that data may not be perfectly symmetrical, and therefore some degree of skewness may exist. The coefficients of skewness were 0.98, 0.49, 0.97, 1.6, -0.29 and 0.88 for RIMP, IPI, DPI, RINC, ER and

RFR respectively. It means that all the observations are weakly positively skewed apart from ER which has weak negative skewness. RINC had the highest positive skewness while IPI had the least positive skewness. On the other hand, Kurtosis measures peakedness or flatness of the distribution of the series. A distribution is mesokurtic (normally distributed) if it has kurtosis equal to three (3). Leptokurtic distribution means a positive kurtosis (peaked curve) indicating there are more higher values than the sample mean for the variable while platykurtic distribution implies negative kurtosis (flattened curve) meaning that there are more lower values than the sample mean of the data. The summary statistics shows the Kurtosis of each of the variables under study. For example, RIMP (2.85), DPI (2.67) and RFR (2.70) indicate that these variables tend towards mesokurtic distribution.

The JB statistic is a goodness of fit test used to establish whether sample data have skewness and kurtosis matching a normal distribution. The hypothesis test for normal distribution using the JB test involves hypothesis testing with null hypothesis of the test stated being that the distribution is normal. If the ρ -value is less than 0.05, the null hypothesis is rejected and the conclusion is that the distribution is normal. The p-values of the JB statistic for RIMP, DPI, RINC and RFR were 0.048, 0.045, 0.045 and 0.000 indicating that the data for these variables for the period under study was normally distributed.

4.2.2 Graphical presentation of the data

To analyze the trend of the data on all the variables, the natural logarithms of the actual data were plotted on time graphs. The graphs are presented in figures 4.1-4.6 that follow. The graphs indicate that all the variables under study apart from IPI were on an upward trend from 1980 to 2017 suggesting the existence of a relationship among

the variables. LNIPI showed a relatively constant trend suggesting that prices of imports have not changed significantly over the research period.

i) LNRIMP

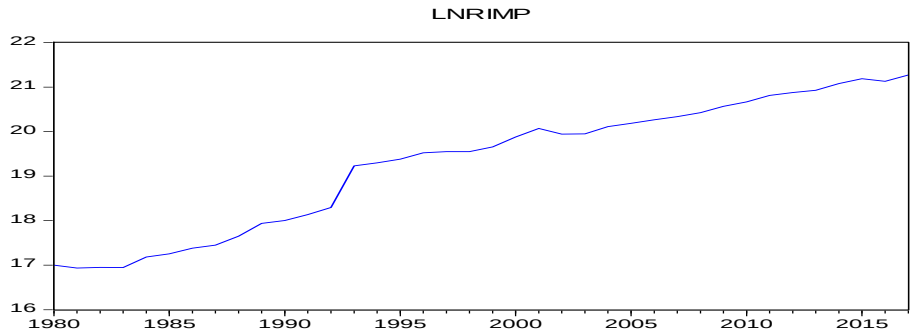

Figure 4.1: Graph of the logarithm of real imports
Source: Author (2020)

ii) LNIPI

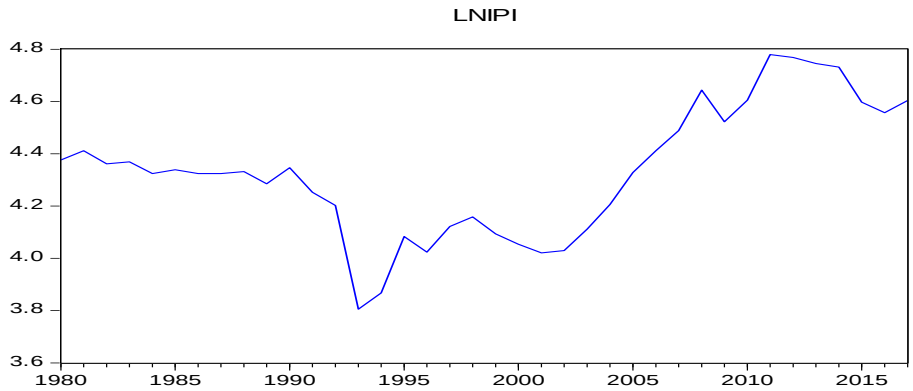

Figure 4.2: Graph of the logarithm of IPI
Source: Author (2020).

iii) LNDPI

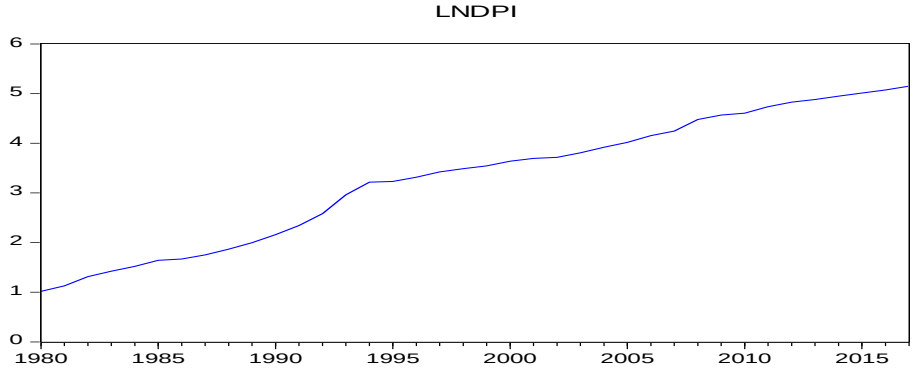

Figure 4.3: Graph of the logarithm of DPI
Source: Author (2020).

iv) LNRINC

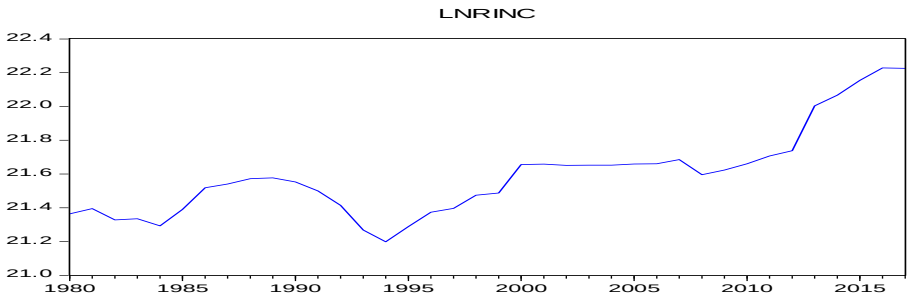

Figure 4.4: Graph of the logarithm of real income
Source: Author (2020)

v) LNER

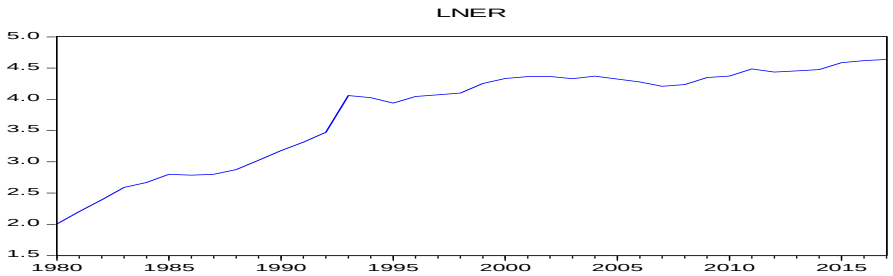

Figure 4.5: Graph of the logarithm of exchange rate
Source: Author (2020).

vi) LNRFR

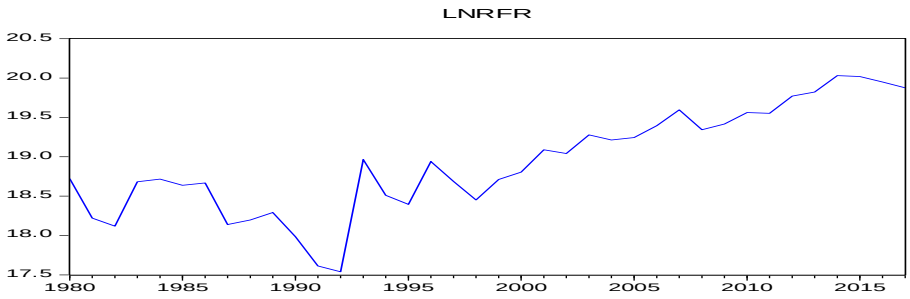

Figure 4.6: Graph of the logarithm of real foreign reserves
Source: Author (2020)

4.2.3 Stationary test results

This study conducted both the ADF and PP test of stationarity in order to come to a robust conclusion about the stationary of the data. Both tests reveal that all the variables are integrated of order one both with constant and no trend and constant with trend.

The p-value of the ADF unit root test statistic in levels for LNRIMP, LNIPI, LNDPI, LNRINC, LNER and LNRFR series was greater than 0.05. Therefore, the null hypothesis of presence of unit root (non-stationarity) was not rejected meaning that the series were non-stationary in levels with intercept, with trend and intercept and without trend. However, at first difference, the null hypothesis was rejected since all the p-values were less than 0.05. Therefore, the study concluded that all the variables were stationary at first difference both with intercept, with trend and intercept and without trend. Therefore all the variables under study are I(1). The results are summarized in table 4.2 as under.

i) ADF test

Table 4.2: ADF test results

Variable	Levels		First difference		Conclusion
	Constant, no trend	Constant trend	Constant, no trend	Constant trend	
LNRIMP	-0.823885	-1.326991	-5.772779*	-5.8163*	I(1)
LNIPI	-1.025028	-1.623316	-5.475049*	-5.542312*	I(1)
LNDPI	-1.366867	-1.761258	-3.430553**	-3.618264**	I(1)
LNINC	0.703805	-0.872652	-4.231665*	-4.429581*	I(1)
LNER	-2.989889	-1.626702	-4.846582*	-5.340226*	I(1)
LNRFR	-1.24798	-2.903145	-7.072556*	-7.006759*	I(1)

Source: Author's compilation from study data (2020)

ii) Phillips Peron test

Table 4.3: PP test results

Variable	Levels		First difference	Conclusion
	Constant, no trend	Constant trend	Constant, no trend	Constant trend
LNRIMP	-0.831322	-1.326991	-5.773749*	-5.851576*	I(1)
LNIPI	-1.10701	-1.662267	-5.46564*	-5.544135*	I(1)
LNDPI	-1.440472	-1.292544	-3.390486**	-3.682795**	I(1)
LNINC	0.213906	-1.416165	-4.206455*	-4.423085*	I(1)
LNER	-2.989889	-1.648172	-4.811481*	-5.340748*	I(1)
LNRFR	-1.119902	-3.670416	-8.308261*	-8.566072*	I(1)

*The asterisks, * and ** denote 1 percent and 5 percent significance levels respectively. I(0) and I(1) denote integration of orders zero and one respectively.*

Source: Authors own computation from study data (2020)

Similarly, the PP test results for LNRIMP, LNIPI, LNDPI, LNRINC, LNER and LNRFR series returned a $\rho>0.05$ with intercept, with trend and intercept and without trend and intercept in levels. For example, the p-value for LNRIMP series in levels and with intercept, without trend was 0.7983. The null hypothesis of presence of unit root (non-stationarity) was accepted. However, at first difference, the null hypothesis was rejected since all the p-values were less than 0.05. Therefore, the study concluded that all the variables were stationary at first difference both with intercept, with trend and intercept and without trend confirming the ADF test results. Therefore the study made a robust conclusion that all the variables in the model were I(1). The results are summarized in table 4.3 above.

4.2.4 Optimal lag length

This study used the AIC to select the optimal lag length. Since the sample size was only 38, a maximum lag length of 1 was considered appropriate.

4.2.5 Results from ARDL bounds test of cointegration using the Bounds test

The ARDL estimation results with maximum lag length of 1 gave the following results (table 4.4).

Table 4.4: ARDL estimation results.

Variable	Coefficient	Std. Error	Prob.*
LNRIMP(-1)	0.348803	0.104904	0.0024
LNIPI	-0.221398	0.185503	0.2423
LNDPI	0.593661	0.174503	0.0020
LNRINC	0.016246	0.087863	0.8546
LNRFR	0.069304	0.039839	0.0925
LNER	0.597597	0.241277	0.0193
LNER(-1)	-0.361902	0.155578	0.0272
C	9.018214	2.607564	0.0017

Source; Author's compilation from study data (2020)

ARDL Bounds test results

The ARDL model was subjected to the bounds test for long run association among the variables. This yielded the results in table 4.5 that follows. The null hypothesis for the bounds test was; No long run association exists among the variables

Table 4.5: Bounds test results

Dependent Variable	F Statistic	F Critical I(0) **	F Critical I(1) **	Accept/Reject H0	Cointegration Exist	Implication
LNRIMP	6.454030	2.62**	3.79**	Reject H0	YES	Estimate ECM

Source: Author's compilation from study data (2020)

Since the F-statistic (6.45403) was greater than the critical value for the upper bound I(1) at 5% significance level(3.79), the null hypothesis of no cointegration was rejected and the alternative of presence of long-run co-integration is accepted. This indicates that aggregate import demand and its determinants are cointegrated at 5 percent significance level. Therefore, the study went on to estimate the long run model.

4.2.6 Static Long-run model

The results obtained by normalizing the real import ($LNRIMP_t$) in the long run are reported in Table 4.6 below. Detailed results are presented in appendix 4.

Table 4.6: Estimated Long Run Coefficients with the regress and being LNRIMP$_t$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.23261	2.722432	5.96254	0.0000
LNIPI	-0.71176*	0.211496	-3.36538	0.0020
LNDPI	1.216965*	0.150193	8.1027	0.0000
LNRINC	0.040755	0.114734	0.355209	0.7248
LNER	-0.16838	0.2176	-0.77378	0.4447
LNRFR	0.09999***	0.051793	1.930566	0.0624

R^2= 0.995669 F-statistic= 1471.186 P(F)=0.000

*Note: *, *** imply significant at the 1and 10 percent levels respectively.*

Source: Author (2020).

The estimated long run equation from table 4.4 is specified as follows;

$$LNRIMP_t = 16.23261 - 0.712LNIPI_t + 1.217LNDPI_t + 0.0408LNRINC_t - 0.168LNER_t + 0.010LNRFR_t$$

…….4.1

(t) (5.963) (-3.365) (8.102) (0.355) (-0.774) (1.931)

The regression line fits remarkably well in the data since the R-squared is R^2= 0.995669. R-square is a good ness of fit measure which measures the percentage of changes in the dependent variable that are explained jointly by the independent variables in the model. In this case, the statistic indicates that 99.5 percent of the variations in LNRIMP is explained by joint variations in LNIPI, LNDPI, LNRINC, LNER and LNRFR. The remaining 0.5 percent is explained by other factors other than the five.

The coefficient of LNIPI is -0.71176 and its P-value is 0.002. The null hypothesis of the variable not being significant was therefore rejected and the alternative hypothesis accepted. This implies that import price index has a negative and significant effect on Kenya's real aggregate imports in the long run. The coefficient of LNDPI was 1.216965 with a t-statistic of 8.1027 and p-value of 0.0000. This meant that LNDPI was significant at 1 percent level of significance. It meant that Domestic Price Index had a positive and significant effect on the country's real aggregate imports. The results also

indicate that the coefficient of LNRFR was 0.0999 with a p-value of 0.0624. This coefficient is therefore positive and significant at 10 percent significance level implying that real foreign reserves positively and significantly affect Kenya's aggregate imports. The confidents of LNRINC and LNER were 0.040755 (p-value=0.7248) and -0.16838 (p-value=0.4447). Since P-values are more than 0.05, the hypothesis test of the variables being insignificant failed to reject the null hypothesis revealing that the variables were not significant.

4.2.7 Error Correction Representation

As indicated earlier in the study, the ARDL bounds test seeks to establish the presence of a long run association among variables. If a long run relations among variables, the error term of the long run model is reparameterized into an error correction term and a model representing both long run and short run dynamics is estimated.

The bounds test results in table 4.5 indicate that there is a long run association between LNRIMP, LNIPI, LNDPI, LNRINC, LNRFR and LNER. Therefore, the study combines both the short run (ARDL) model with the long run model captured by the Error Correction Term (ECT). Regressing D(LNRIMP) on D(LNRIMP(-1)), D(LNIPI), D(LNDPI), D(LNRINC), D(LNER), D(LNER(-1)) and ECT(-1) using OLS yielded the results summarized in table 4.7 and detailed in appendix 6. These results are the basis for the Error Correction Model (ECM).

Table 4.7: ECM estimation results

Variable	Coefficient	Std. Error	Prob.
C	0.001958	0.036691	0.9578
D(LNRIMP(-1))	0.200738	0.122643	0.1133
D(LNIPI)	-0.424162	0.205903	0.0492
D(LNDPI)	0.924997	0.338294	0.0109
D(LNRINC)	0.03056	0.249895	0.9036
D(LNER)	0.124448	0.236604	0.6032
D(LNER(-1))	-0.344767	0.170026	0.0526
D(LNRFR)	0.155205	0.052747	0.0066
ECT6(-1)	-0.651795	0.155747	0.0003
R-Squared	0.821964		
F-statistic	15.58179		
p(F)	0.000000		

Source: Author (2020)

The estimated coefficient of the Error Correction Term ECT_{t-1} was -0.652 with a t-statistic of 0.155747 and p-value of 0.0003. The coefficient was negative and significant at 5 percent significance level since p-value was less than 0.05. The sign and significance of this coefficient was as per expectation indicating the validity of the long run equilibrium relationship among the variables in the aggregate import demand function. The R^2 of the model is 0.821964. This indicates the strength of the relationship among LNRIMP and its explanatory variables LNIPI, LNDPI, LNRINC, LNER, and LNRFR jointly. It suggests that about 82% of the variations in LNRIMP are caused jointly by variations in LNIPI, LNDPI, LNRINC, LNER and LNRFR.

The size of the coefficient of the error correction term (ECT_{t-1}) indicates the speed of adjustment of the equilibrium towards a long-run stable state. This coefficient suggests that the convergence to long run equilibrium after short run deviation is -0.652. It implies that the system corrects its previous year period's disequilibrium by 65.2% in a year.

4.2.7.1 Short run dynamics

According to Mairura (2019), a basic assumption in the long run is that importers are always on their demand schedules implying that import demand always equals the actual level of imports. He notes that, it is generally acknowledged that imports do not instantaneously adjust to their long run equilibrium level following a change in any of their determinants. Factors such as costs of adjustment and delivery lags are responsible for the slow adjustment by economic agents to the changes in the determinants of import demand (Mairura C. , 2019). Since there was presence of cointegration among the variables in the import demand function, the study estimated both the short run and long run model.

Results in table 4.7 indicate that in the short run, the coefficient of D(LNIPI) was -0.424162 with a P-value of 0.0492 which is less than 0.05. This implies that import price index negatively and significantly affected real aggregate imports. The coefficient for D(LNDPI) was 0.924997 with a p-value of 0.0109. This means that LNDPI positively and significantly influenced LIRIMP at 5 percent level of significance. The results also indicate that RFR positively and significantly affected RIMP. The coefficients can be interpreted as short run elasticities of Kenya's aggregate real imports with respect to the various explanatory variables. For example, the coefficient of LNIPI (-0.424162) means that the elasticity of Kenya's aggregate real imports with respect to the import unit value index was negative native but less than unity implying that the countries imports are less price elastic while the coefficient for LNDPI(0.924997) implies that imports are more responsive to domestic prices that import prices. On the other hand, the coefficients of lagged imports, LNRINC and LNER were all insignificant at 5 percent level since their p-values were more than 0.05. The coefficients would still be insignificant at 10 percent level as well. Therefore, the

variables do not significantly explain the country's aggregate imports. It is worth noting, from the same results, that lagged Exchange Rate $D(LNER_{t-1})$ negatively and significantly affects Kenya's real aggregate imports at 10 percent significance level since the coefficient had a p-value of 0.0526.

4.2.8 Post estimation diagnostic tests

4.2.8.1 Stability test result

As indicated earlier, the effectivenemss of import (trade) policy depends on the stability of the aggregate import demand function. This study used the CUSUM test to establsih the stability of the estimated ECM. Figure 4.7 below shows that the plot of CUSUM stays within the critical 5% bounds. This means that estimated ECM is stable.

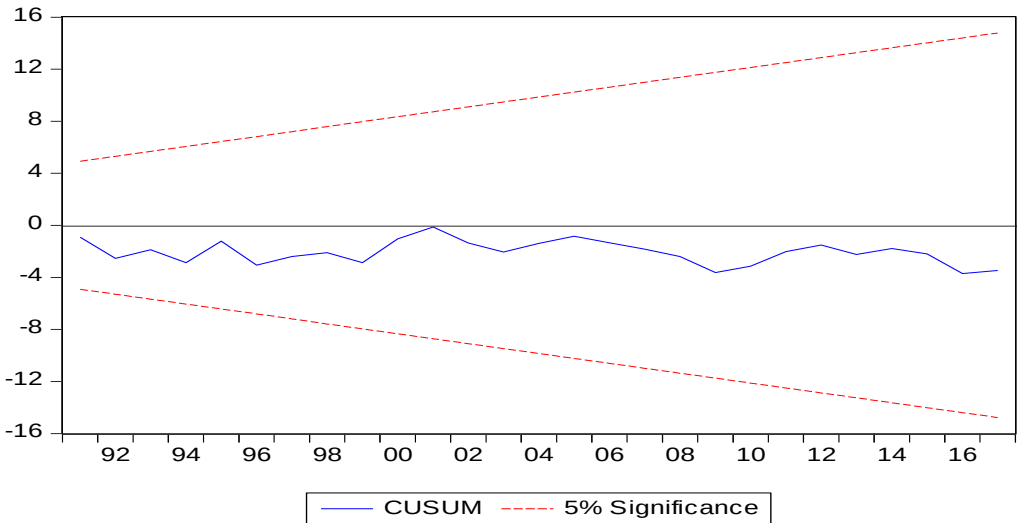

Figure 4.7: Plot of Cumulative Sum of Recursive Residuals (CUSUM)
Source: Author (2020)

4.2.8.2 Serial correlation test results

The procedure for the Breusch Godfrey test for serial correlation involved running an OLS regression of LNRIMP on all the independent variables followed by a regression of the residuals obtained on the independent variables and lagged values of the estimated residuals. The null hypothesis of the test is that there is no autocorrelation

among the residuals. Table 4.8 below is a summary of the results obtained from the procedure.

Table 4.8: Breusch-Godfrey Serial Correlation LM Test results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.595789	Prob. F(2,25)	0.5588
Obs*R-squared	1.637809	Prob. Chi-Square(2)	0.4409

Source: Author (2020)

The probability of F value is 0.5588 which is way above 5% statistical significance level. Similarly, the probability of the Chi-Square statistic was 0.4409 which is greater than 0.5.The study therefore failed to reject the null hypothesis and concluded that there was no serial correlation among the residuals. Therefore, the aggregate import demand function estimated has no serial correlation.

4.2.8.3 Heteroscedasticity test results

This study conducted the heteroscedasticity test to ensure that the OLS assumption of homoscedasticity in the error term is not violated. This study used the Breusch–Pagan–Godfrey Test to test the presence of heteroscedasticity in the regression model. The following is a summary the results of the test. Detailed results are presented in appendix 8

Table 4.9: Summary of heteroscedasticity test results

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.343026	Prob. F(8,27)	0.2655
Obs*R-squared	10.2477	Prob. Chi-Square(8)	0.2481
Scaled explained SS	6.480292	Prob. Chi-Square(8)	0.5936

Source: Author(2020)

The probability of F value is 26.55%. This is above the 5% statistical significance. The study therefore failed to reject the null hypothesis and concluded that there was no heteroscedasticity. Therefore the error term in the estimated aggregate import demand function for Kenya was homoscedastic.

4.2.8.4 Multicollinearity test results

As indicated in chapter three, this study prepared a correlation matrix of all the variables in order to determine the extent of multicollinearity among independent variables. Typically, a correlation matrix is as square matrix which shows correlations between variables. The line of 1.00s going from the top left to the bottom right is the main diagonal, which shows that each variable always perfectly correlates with itself. This matrix is symmetrical, with the same correlation shown above the main diagonal being a mirror image of those below the main diagonal. The correlation matrix of the independent variables under study is presented in table 4.10 below. The table indicates that there is no perfect collinearity amongst any of the independent variables. However the correlation coefficient between LNDPI and ER was highest at 0.9563 implying that there is a very high degree of positive association among the two variables. This could is an indicator of high multicollinearity among the two. Similarly, the correlation coefficient between LNDPI and LNRFR was also high (0.8178) indicating existence of a high degree of multicollinearity. However, since none of the variables were perfectly collinear, the study considered that multicollinearity problem was not serious.

Table 4.10: Correlation matrix of independent variables

	LNRIMP	LNIPI	LNDPI	LNRINC	LNER	LNRFR
LNRIMP	1.0000	0.3119	0.9946	0.6988	0.9696	0.8098
LNIPI	0.3119	1.0000	0.3824	0.6216	0.1131	0.5372
LNDPI	0.9946	0.3824	1.0000	0.7249	0.9563	0.8178
LNRINC	0.6988	0.6216	0.7249	1.0000	0.5861	0.7361
LNER	0.9696	0.1131	0.9563	0.5861	1.0000	0.6986
LNRFR	0.8098	0.5372	0.8178	0.7361	0.6986	1.0000

Source: Author's compilation

4.2.8.5 Ramsey RESET test results

This test was conducted to determine whether the ECM estimated in this study was correctly specified. Details of the results of the test are presented in appendix 9. The t-statistic of the squared coefficient of the fitted LNRIMP was 1.614 with a P-value of

0.1186 which is greater than 0.5. Therefore, the study failed to reject H0 implying the model was correctly specified.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings from the research, conclusions drawn therefrom, and recommendations on the implications of the research findings for policy makers and researchers in the same area.

5.2 Summary of Findings

The general objective of this study was to analyze the determinants of aggregate imports in Kenya. To achieve this objective, the study analyzed the effect of import price index, domestic price index, real income, exchange rates and real foreign reserves on aggregate imports in Kenya using ARDL modeling. The study used data from Kenya National Bureau of Statistics, World Bank and Central Bank of Kenya from 1980-2017.The conceptual and analytical framework was underpinned in the Benchmark model which considers imports of a country as a function of relative prices and National Income. The study augmented the traditional import demand model by adding exchange rate and real foreign reserves as determinants if imports in the country.

Descriptive statistics of the data on the variables under study revealed that average real aggregate imports for the country were Sh. 2,472,852,611.94 over the study period. The statistics also revealed that the average import unit value index was 78.42 percent while the domestic price index was 51.51646 percent. However, the study found that DPI was more variable with an absolute range of 169.7 since the maximum and minimum values for IPI 119.0800 and 44.95000 while the values for DPI were 172.4282 and 2.766558. The coefficients of skewness were 0.98, 0.49, 0.97, 1.6, -0.29 and 0.88 for RIMP, IPI, DPI, RINC, ER and RFR respectively indicating that the data on all the variables were

weakly positively skewed apart from ER which has weak negative skewness. RINC had the highest positive skewness while IPI had the least positive skewness.

Graphical analysis of the data revealed that all the variables under study apart from IPI were on an upward trend from 1980 to 2017 suggesting the existence of a relationship among the variables. LNIPI showed a relatively constant trend suggesting that prices of imports have not changed significantly over the research period. Both the ADF and PP tests of stationarity tests revealed that all the variables are integrated of order one both with constant no trend and constant with trend.

The ARDL bounds test produced an F-statistic of 6.45403 which was greater than the critical value for the upper bound I(1) at 5% significance level(3.79). This indicated the existence of long run relationship among the independent variables and dependent variable. This finding is consistent with most other past studies such as Mwega (1993), Dutta and Ahmed (2006), Mairura and Swammy (2015) and (Mairura (2019). Consquently, the study estimated both the short run and long run (ECM) model. This follows the procedure in most previous studies in which variables in the model are cointegrated.

The coefficients in the ECM specification of Kenya's aggregate imports show that domestic prices are that main determinant of Kenya's imports influencing imports positively in the short run. This is indicated by the short run coefficient of LNDPI which was 0.925 and was significant at 5 percent level. The coefficient is close to unity indicating that that in the short run, imports grow close to one-for-one with increase in the domestic price index. Specifically, a one percent increase in the domestic price index would cause real aggregate imports to increase by around 0.925 percent. This implies that the pace of growth in the domestic price index highly and positively affects

the growth in Kenya's imports. The sign of the coefficient matches the a priori expectation since its positive. However, this finding conflicts the findings in (Mairura & Swammy, 2015) and (Mairura C., 2019) both of which found that the short run coefficient for domestic price was negative.

The short run coefficient of LNIPI was -0.424. This coefficient was negative as per expectation and significant indicating that import price index natively and significantly affects the country's real aggregate imports in the short run. This coefficient implies that for every 1% rise in the import price index, the real aggregate imports of Kenya will fall by 0.424 percent. This finding contradicts with findings of Dutta and Ahmed (2006).

The coefficient of real income (LNRINC) was positive as expected but insignificant implying that the country's GDP does not significantly affect aggregate imports. This finding is in agreement with that of Ibrahim (2017) and Nyoni (2004) among others but contradicts with the findings of Dutta and Ahmed (2006) who found that income was a significant determinant of aggregate imports.

The lagged exchange rate coefficient in the short run was negative as was in the prior expectation of the study and was significant. It implies that depreciation in the exchange rate makes imports expensive to domestic consumers and consequently reduces their demand for imports. Deprecation in the exchange rate by 1 percent will lead to a reduction in imports by 0.3447 percent in the subsequent period. This result is consistent with the findings in Cevik, S. (2001). On the other hand, the coefficient of the exchange rate without a lag is insignificant though positive.

Lastly, the short run coefficient of LNRFR was 0.155205 and was significant. The coefficient is in line with the prior expectation, that is, an increase in foreign reserves,

all things being equal, will lead to an increase in the domestic demand for foreign goods. This implies that a rise in real foreign reserves of the country by 1 percent will lead to a rise in imports by 0.155 percent. The result agrees with findings of Nyoni (2004).

The estimated coefficient of the Error Correction Term (ECT_{t-1}) was -0.652 and was significant at 5 percent level as per prior expectation. This indicates that the system will adjust to its long run equilibrium at a speed of 65.2 percent. It also indicates the validity of the long run equilibrium relationship among the variables in the aggregate import demand function. The goodness of fit of the ECM was satisfactory because it was 82.19 percent (R^2=0.821964). The F-statistic was also significant. Further, the ECM specification was supported by the CUSUM test of staibility, Breusch Godfrey serial correlation test, Breusch–Pagan–Godfrey test of heteroscedasticity and Ramsey RESET test of misspecification.

In the long run, Kenya's real aggregate imports were found to be highly elastic with respect to domestic prices as was the case in the short run. This was indicated by the long run coefficient of LNDPI which was 1.216965 implying that as the price of domestic goods rise, domestic goods are substituted with imported goods. Specifically, a 1 percent rise in the domestic price index will lead to an increase in imports by 1.217 percent holding other factors constant. Additionally, this coefficient is higher than that of LNIPI in (absolute terms) meaning the Kenya's imports are more elastic to domestic prices that prices of imports. The coefficient has the expected sign is consistent with other previous studies such as (Mairura C., 2019) and (Mairura & Swammy, 2015).

On the other hand, own price elasticity of imports in Kenya was less than unity and negative in the long run implying that Kenya's import demand agrees with the consumer theory. This is indicated by the long run coefficient of LNIPI which was -

0.71176. The coefficient is in line with the with the Goldstein-Khan (1985) ranges of (-0.50, -1.00) for typical price elasticity. However, the sign of the coefficient of the import price contradicts the findings in Mairura (2019).

Real Foreign Reserves significantly and positively affect the country's real aggregate imports. This is because the numerical magnitude of the long run coefficient of LNRFR was 0.09999 and was significant at 10 percent level. It implies that for every 1 percent rise in the level of real foreign reserves, the country's imports will increase by about 0.1 percent, thus, increased growth in foreign reserves will likely result in a substantial increase in aggregate imports in the long run.

On the other hand, the long run coefficients of LNRINC and LNER were found to be insignificant though with the expected signs. It implies that growth Kenya's income and deprecation of the Kenya shilling will least likely lead to a rise in the county's imports. The finding on the relationship between real income and Kenya's aggregate imports implies that the Keynesian import demand framework has limited application in Kenya. It fails to validate the idea of Keynes (1936) that a country's aggregate imports is a function of its aggregate income level. The finding also contradicts the findings by Nyoni (2004), Otoro (2008) and Mairura and Swammy (2015) who establsihed that income was a significant determinant of aggregate imports albeit in Tanzania, Ethiopia and COMESA for ecah of them respectively. Simlalarly, the fining of this study on LNER contradicted that Otoro (2008) who gound that ER was a significant determinant of aggregate imports. However, the finding agrees with Harvey and Sedegah (2011).

5.3 Conclusion and Policy recommendation

From the study findings, this paper concludes that the rising levels of imports in the country can be attributed to changes in prices of domestic products, changes in prices of imports, exchange rate and real foreign reserves. The country's income is not a significant determinant of imports in the country.

Since the coefficient of domestic price is positive, any policy geared to either increase or decrease the country's imports should start by considering this variable. If Kenya is to reduce its balance of payment deficit by reducing imports, both in the long run and short run, then efforts should be directed towards making domestically produced goods cheaper. The country should focus on making locally produced goods price competitive. This can be implemented by installing efficient production sectors within the economy.

In addition to the above, the coefficient of Import price index indicates a rise in the price level of imports will lead to a reduction in imports. This implies that trade restriction policies such as tariffs and non-tariff barriers which lead to higher import prices will effectively work to control the country's level of aggregate imports. Similarly, exchange rate control and depreciation of currency will effectively influence the country's level of imports. This policy is also supported by the coefficient of lagged exchange rate in the ECM. Therefore, this study recommends the implementation of both tariff and non-tariff barriers in order to control the country's level of imports.

Thirdly, the study findings suggest that the Central Bank of Kenya through management of the foreign exchange reserves can significantly influence the country's imports. By increasing the level of foreign exchange reserves, the country can achieve higher import levels. Conversely, if the country seeks to restrict imports, then they could reduce the

levels of foreign exchange reserves. The study also recommends that government should not consider manipulating the exchange rate in order to affect the countries level of imports since exchange rate does not significantly affect aggregate imports.

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APPENDICES

Appendix 1: The Budget

Cost of the Study	
Cost of typing and printing @ Shs. 40 per page	1,600.00
Internet costs	6,000.00
Binding	500.00
Travelling costs	4,000.00
Projected costs of the project	
Travelling expense	12,000.00
Cost of hiring an assistant	7,000.00
Cost of processing data	15,000.00
Cost of typing final document	5,000.00
Cost of producing other three copies	2,000.00
Cost of binding the final copies	5,000.00
Subtotal	58,100.00
Contingencies (30 percent of subtotal)	17,430.00
Total cost of the research	**75,530.00**

Appendix 2: Study data

	RIMP	IPI	DPI	RINC	ER	RFR
1980	24143821	79.53000	2.766558	1.90E+09	7.420187	1.35E+08
1981	22627259	82.42000	3.087563	1.96E+09	9.047498	81896292
1982	22972314	78.38000	3.725661	1.83E+09	10.92232	73978811
1983	22939642	78.96000	4.150304	1.84E+09	13.31152	1.30E+08
1984	29065039	75.50000	4.577126	1.77E+09	14.41387	1.34E+08
1985	31206106	76.65000	5.172452	1.95E+09	16.43212	1.24E+08
1986	35440963	75.50000	5.303537	2.22E+09	16.22574	1.28E+08
1987	37904551	75.50000	5.761639	2.26E+09	16.45449	75436871
1988	46404927	76.08000	6.468302	2.34E+09	17.74710	79943705
1989	61664347	72.62000	7.360236	2.35E+09	20.57247	87872179
1990	65922694	77.23000	8.669020	2.29E+09	24.04017	64669364
1991	75229999	70.31000	10.41015	2.17E+09	27.50787	44562283
1992	88396552	66.85000	13.25549	2.00E+09	32.21683	41413789
1993	2.25E+08	44.95000	19.35021	1.72E+09	58.00133	1.72E+08
1994	2.41E+08	47.84000	24.92586	1.61E+09	56.05058	1.09E+08
1995	2.61E+08	59.36000	25.31329	1.76E+09	51.42983	97506094
1996	3.01E+08	55.90000	27.55708	1.92E+09	57.11487	1.68E+08
1997	3.09E+08	61.67000	30.68807	1.96E+09	58.73184	1.30E+08
1998	3.09E+08	63.97000	32.75106	2.12E+09	60.36670	1.03E+08
1999	3.44E+08	59.94000	34.63163	2.15E+09	70.32622	1.34E+08
2000	4.30E+08	57.63000	38.08787	2.54E+09	76.17554	1.47E+08
2001	5.21E+08	55.73000	40.27358	2.55E+09	78.56319	1.95E+08
2002	4.58E+08	56.24000	41.06347	2.53E+09	78.74914	1.86E+08
2003	4.62E+08	61.06000	45.09413	2.53E+09	75.93557	2.36E+08
2004	5.43E+08	67.07000	50.33589	2.53E+09	79.17388	2.21E+08
2005	5.84E+08	75.83000	55.52692	2.55E+09	75.55411	2.28E+08
2006	6.33E+08	82.39000	63.55264	2.55E+09	72.10084	2.65E+08
2007	6.80E+08	89.02000	69.75466	2.62E+09	67.31764	3.24E+08
2008	7.42E+08	103.9100	88.05816	2.39E+09	69.17532	2.52E+08
2009	8.56E+08	92.07000	96.18956	2.46E+09	77.35201	2.70E+08
2010	9.47E+08	100.0000	100.0000	2.55E+09	79.23315	3.13E+08
2011	1.09E+09	119.0800	114.0225	2.67E+09	88.81077	3.10E+08
2012	1.17E+09	117.7300	124.7153	2.76E+09	84.52960	3.85E+08
2013	1.23E+09	115.0700	131.8458	3.60E+09	86.12288	4.06E+08
2014	1.43E+09	113.5100	140.9144	3.83E+09	87.92000	5.00E+08
2015	1.59E+09	99.23000	150.1896	4.18E+09	98.18000	4.95E+08
2016	1.50E+09	95.32000	159.6473	4.51E+09	101.5000	4.61E+08
2017	1.73E+09	99.90000	172.4282	4.49E+09	103.4100	4.28E+08

Appendix 3: ARDL estimation results

Dependent Variable: LNRIMP
Method: ARDL
Date: 09/12/19 Time: 13:53
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): LNIPI LNDPI LNRINC LNER LNRFR
Fixed regressors: C
Number of models evaluated: 32
Selected Model: ARDL(1, 0, 0, 0, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRIMP(-1)	0.348803	0.104904	3.324972	0.0024
LNIPI	-0.221398	0.185503	-1.193498	0.2423
LNDPI	0.593661	0.174503	3.402010	0.0020
LNRINC	0.016246	0.087863	0.184907	0.8546
LNER	0.597597	0.241277	2.476806	0.0193
LNER(-1)	-0.361902	0.155578	-2.326175	0.0272
LNRFR	0.069304	0.039839	1.739612	0.0925
C	9.018214	2.607564	3.458483	0.0017

R-squared	0.997611	Mean dependent var	19.35177
Adjusted R-squared	0.997034	S.D. dependent var	1.419705
S.E. of regression	0.077318	Akaike info criterion	-2.092970
Sum squared resid	0.173364	Schwarz criterion	-1.744663
Log likelihood	46.71994	Hannan-Quinn criter.	-1.970176
F-statistic	1729.819	Durbin-Watson stat	1.926668
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Appendix 4: ARDL Bounds test result

ARDL Bounds Test
Date: 09/12/19 Time: 13:54
Sample: 1981 2017
Included observations: 37
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.454030	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Test Equation:
Dependent Variable: D(LNRIMP)
Method: Least Squares
Date: 09/12/19 Time: 13:54
Sample: 1981 2017
Included observations: 37

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNER)	1.045335	0.190237	5.494917	0.0000
C	8.960266	3.468761	2.583132	0.0151
LNIPI(-1)	-0.055585	0.220633	-0.251935	0.8029
LNDPI(-1)	0.510523	0.238682	2.138930	0.0410
LNRINC(-1)	0.013314	0.105979	0.125628	0.9009
LNER(-1)	0.410484	0.209007	1.963972	0.0592
LNRFR(-1)	0.025075	0.061493	0.407776	0.6864
LNRIMP(-1)	-0.657042	0.151582	-4.334570	0.0002

R-squared	0.767307	Mean dependent var	0.115413
Adjusted R-squared	0.711140	S.D. dependent var	0.162230
S.E. of regression	0.087192	Akaike info criterion	-1.852608
Sum squared resid	0.220469	Schwarz criterion	-1.504302
Log likelihood	42.27326	Hannan-Quinn criter.	-1.729814
F-statistic	13.66109	Durbin-Watson stat	1.830592
Prob(F-statistic)	0.000000		

Appendix 5: Long run estimation results

Dependent Variable: LNRIMP
Method: Least Squares
Date: 09/12/19 Time: 12:56
Sample: 1980 2017
Included observations: 38

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.23261	2.722432	5.962540	0.0000
LNIPI	-0.711764	0.211496	-3.365376	0.0020
LNDPI	1.216965	0.150193	8.102700	0.0000
LNRINC	0.040755	0.114734	0.355209	0.7248
LNER	-0.168375	0.217600	-0.773783	0.4447
LNRFR	0.099991	0.051793	1.930566	0.0624

R-squared	0.995669	Mean dependent var	19.28987
Adjusted R-squared	0.994992	S.D. dependent var	1.451445
S.E. of regression	0.102716	Akaike info criterion	-1.569749
Sum squared resid	0.337622	Schwarz criterion	-1.311183
Log likelihood	35.82524	Hannan-Quinn criter.	-1.477753
F-statistic	1471.186	Durbin-Watson stat	1.053264
Prob(F-statistic)	0.000000		

Appendix 5: Error correction term

1980	0.238059
1981	0.147214
1982	-0.057436
1983	-0.208236
1984	-0.110914
1985	-0.151904
1986	-0.076138
1987	-0.055477
1988	0.017145
1989	0.126338
1990	0.095610
1991	0.000222
1992	-0.131039
1993	0.022589
1994	-0.131649
1995	0.079525
1996	0.035605
1997	0.029235
1998	0.001026
1999	-0.006417
2000	0.069171
2001	0.145318
2002	0.006007
2003	-0.071962
2004	0.037063
2005	0.067059
2006	0.018744
2007	-0.000777
2008	-0.053585
2009	-0.093459
2010	0.007289
2011	0.132863
2012	0.050640
2013	0.004605
2014	0.043143
2015	-0.005057
2016	-0.155215
2017	-0.065205

Appendix 6: ARDL-ECM model for LNRIMP

Dependent Variable: D(LNRIMP)
Method: Least Squares
Date: 09/11/19 Time: 13:35
Sample (adjusted): 1982 2017
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001958	0.036691	0.053358	0.9578
D(LNRIMP(-1))	0.200738	0.122643	1.636773	0.1133
D(LNIPI)	-0.424162	0.205903	-2.060006	0.0492
D(LNDPI)	0.924997	0.338294	2.734299	0.0109
D(LNRINC)	0.030560	0.249895	0.122293	0.9036
D(LNER)	0.124448	0.236604	0.525974	0.6032
D(LNER(-1))	-0.344767	0.170026	-2.027729	0.0526
D(LNRFR)	0.155205	0.052747	2.942452	0.0066
ECT6(-1)	-0.651795	0.155747	-4.184952	0.0003

R-squared	0.821964	Mean dependent var	0.120421
Adjusted R-squared	0.769212	S.D. dependent var	0.161604
S.E. of regression	0.077635	Akaike info criterion	-2.061269
Sum squared resid	0.162736	Schwarz criterion	-1.665389
Log likelihood	46.10285	Hannan-Quinn criter.	-1.923097
F-statistic	15.58179	Durbin-Watson stat	2.167212
Prob(F-statistic)	0.000000		

Appendix 7: Serial Correlation LM test results

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.595789	Prob. F(2,25)	0.5588
Obs*R-squared	1.637809	Prob. Chi-Square(2)	0.4409

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 09/11/19 Time: 14:02
Sample: 1982 2017
Included observations: 36
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004408	0.037489	-0.117574	0.9073
D(LNRIMP(-1))	0.124610	0.172396	0.722817	0.4765
D(LNIPI)	0.042006	0.212830	0.197368	0.8451
D(LNDPI)	-0.088497	0.353385	-0.250426	0.8043
D(LNRINC)	0.006174	0.253796	0.024328	0.9808
D(LNER)	0.121963	0.265195	0.459898	0.6496
D(LNER(-1))	-0.106676	0.201520	-0.529356	0.6012
D(LNRFR)	-0.013579	0.055756	-0.243542	0.8096
ECT6(-1)	0.160367	0.318355	0.503738	0.6189
RESID(-1)	-0.358776	0.456478	-0.785966	0.4393
RESID(-2)	0.129426	0.259722	0.498325	0.6226

R-squared	0.045495	Mean dependent var	-2.06E-17
Adjusted R-squared	-0.336307	S.D. dependent var	0.068188
S.E. of regression	0.078824	Akaike info criterion	-1.996720
Sum squared resid	0.155332	Schwarz criterion	-1.512867
Log likelihood	46.94096	Hannan-Quinn criter.	-1.827842
F-statistic	0.119158	Durbin-Watson stat	2.003631
Prob(F-statistic)	0.999347		

Appendix 8: Test of Heteroscedasticity results

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.343026	Prob. F(8,27)	0.2655
Obs*R-squared	10.24770	Prob. Chi-Square(8)	0.2481
Scaled explained SS	6.480292	Prob. Chi-Square(8)	0.5936

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 09/12/19 Time: 14:00
Sample: 1982 2017
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002834	0.003129	0.906009	0.3729
D(LNRIMP(-1))	-0.001158	0.010457	-0.110707	0.9127
D(LNIPI)	0.036099	0.017557	2.056134	0.0496
D(LNDPI)	-0.031667	0.028846	-1.097800	0.2820
D(LNRINC)	0.016816	0.021308	0.789172	0.4369
D(LNER)	0.042372	0.020175	2.100238	0.0452
D(LNER(-1))	0.022912	0.014498	1.580354	0.1257
D(LNRFR)	0.005495	0.004498	1.221710	0.2324
ECT6(-1)	0.001779	0.013280	0.133956	0.8944

R-squared	0.284658	Mean dependent var	0.004520
Adjusted R-squared	0.072705	S.D. dependent var	0.006874
S.E. of regression	0.006620	Akaike info criterion	-6.985187
Sum squared resid	0.001183	Schwarz criterion	-6.589307
Log likelihood	134.7334	Hannan-Quinn criter.	-6.847014
F-statistic	1.343026	Durbin-Watson stat	2.438588
Prob(F-statistic)	0.265458		

Appendix 9: Ramsey RESET test results

Ramsey RESET Test
Equation: GOODRESULT
Specification: D(LNRIMP) C D(LNRIMP(-1)) D(LNIPI) D(LNDPI) D(LNRINC) D(LNER) D(LNER(-1)) D(LNRFR) ECT6(-1)
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.613773	26	0.1186
F-statistic	2.604264	(1, 26)	0.1186
Likelihood ratio	3.436533	1	0.0638

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.014816	1	0.014816
Restricted SSR	0.162736	27	0.006027
Unrestricted SSR	0.147920	26	0.005689

LR test summary:

	Value	df
Restricted LogL	46.10285	27