EFFECT OF EXCHANGE RATE MISALIGNMENT ON BILATERAL TRADE BETWEEN KENYA AND EUROPEAN UNION

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DECLARATION

This Thesis is my original work and has not been presented for a degree in any other University or any other award.

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DEDICATION

This Thesis is dedicated to my late wife Naomi Munene, and our children Sophie and Jamin for their encouragement and patience.

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First, my recognition goes to God for giving me strength and wisdom to put this paper together. I would also like to express my sincere gratitude to my joint supervisors Dr. Okeri, and Dr. Korir for their continuous corrections, tolerance, inspiration, and immense guidance. I will forever be indebted to Dr. Patrick Masette Kuuya for tirelessly reading my work and the insightful comments provided. I thank my classmates for their insightful discussions, the tireless days working together before deadlines, and for all the fun we had during our studies. Lastly, I would like to thank my parents who, despite having limited education, have great belief in it. Not to be left out, is my immediate family for supporting me throughout writing this Thesis and my life this far.

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ABBREVIATIONS AND ACRONYMS

ACP	Africa Caribbean and Pacific
AIC	Akaike Information Criteria
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag
ARIMA	Autoregressive Integrated Moving Average
BEER	Behavioral Equilibrium Exchange Rate
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
ECT	Error Correction Term
ECM	Error Correction Model
EPA	Economic Partnership Agreements
ER	Exchange Rate
ERER	Equilibrium Real Exchange Rate
EU	European Union
EuroSTAT	European Statistics
FEER	Fundamental Equilibrium Exchange Rate
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GMM	Generalised Methods of Moments
IMF	International Monetary Fund
KES	Kenya Shilling
NATREX	Natural Real Exchange Rate
NER	Nominal Exchange Rate

OLS	Ordinary Least Squares
PEER	Permanent Equilibrium Exchange Rate
PML	Pseudo-Maximum Likelihood
PPP	Purchasing Power Parity
RER	Real Exchange Rate
REER	Real Effective Exchange Rate
ROK	Republic of Kenya
UIP	Uncovered Interest Parity
USA	United States of America
USD	United States of America Dollar
WTO	World Trade Organisation

OPERATIONAL DEFINITION OF TERMS

Bilateral Trade Flows: export and import flows between Kenya and EU

Balance of Payments Equilibrium: a situation where the demand and supply of any foreign currency in a country is equal in a given time period.

Devaluation: downward adjustment of the domestic currency relative to another currency

Economic fundamentals: a set of economic variables that affect the whole economy.

European Union: Major member countries of the European Union that Kenya traded with between 2000 and 2016.

External balance: a situation where in an open economy there is a balance in the current account, such that exports are equal to imports.

Exchange rate misalignment: the deviation of the real exchange rate from its equilibrium level.

Exchange rate volatility: the trade risk associated with unexpected and unpredictable changes in the exchange rate.

Internal balance: a state where income, employment and price level in a country are in equilibrium.

Nominal exchange rate: the relative price of currencies of two countries.

Productivity: the ratio of investment to Gross Domestic Product

Purchasing Power Parity: the adjustments needed to be made in the exchange rates of two currencies to make them at par with the purchasing power of each other.

Real exchange rate: the ratio of relative prices that compares two countries' consumption baskets.

Real effective exchange rate: value of a currency against a basket of other currencies which takes account of changes in relative prices.

ABSTRACT

The exchange rate is an important variable in international trade due to the expectations that trade reacts to its movements and therefore determines a country's international competitiveness. Prudent management of trade and exchange rate policies have been associated with faster growth in developing countries. In order to orient the economy outwards, Kenya has pursued various measures from 1990s to 2000s. Despite these export oriented efforts, Kenya's trade has remained skewed towards imports and a widening trade deficit which seems to follow the weakening of the Kenya shilling. The main policy dilemma is therefore how imports accelerated in an environment of unhindered European union market access, and hence the motivation of this study. The key objective of this study was to investigate the effect of exchange rate misalignment on Kenya's bilateral trade with the European Union. Secondary data was used on variables considered instrumental in influencing trade between Kenya and EU for the period between 2000 and 2016. Data was collected from Kenya National Bureau of Statistics, Central Bank of Kenya, EuroSTAT and IMF financial statistics. The study adopted a dynamic modelling approach since exchange rate and trade are affected by previous as well as present values. The study results show that the real exchange rate is driven by the economic fundamentals and in terms of misalignment the exchange rate is overvalued to maximum of 5.9 percent and undervalued up to 5.2 percent. The estimated misalignment has a negative effect on imports but positive statistically insignificant for exports. Finally, the exchange rate has a positive effect on trade balance. The results of this study suggest that the monetary authority should ensure the exchange rate remains stable and within the 6 percent range while monitoring all the underlying determinants. Coupled with this, hedging instruments should be made available and affordable.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A country's exchange rate (ER) is the rate at which the domestic currency exchanges for a foreign currency. This rate varies frequently at the foreign exchange markets where various global currencies are traded. The exchange rate is an important variable in the economic processes from both the descriptive and policy perspectives, and has emerged as a significant tool in the arsenal of economic management policies mainly due to its administrative simplicity. This is because a country's exchange rates affect the real economic variables as well as monetary variables. Studying the interconnectedness of the exchange rate with a country's competitiveness therefore, is key among a wide range of economic policy goals (Csermely, 1994). According to Wesseh and Niu, (2012), this results from the fact that the stability of a country's exchange rate and its level relative to its equilibrium level, have an effect in trade growth and volume. Since the collapse of the Bretton Wood institutions, the Exchange rate has emerged as a key issue in both economic and policy discussions especially in developing countries. Some studies argue that pursuance of inappropriate exchange rate led to the international debt crisis of the developing economies in the 1980s, while others have argued that the deterioration of agriculture and external accounts of developing countries was as a result of overvalued exchange rates. Still, others pose that, the free-market policies and economic reforms of the late 1970s in Argentina, Chile, and Uruguay were scattered by inappropriate exchange rate policies (Edwards, 1989).

In international trade therefore, a country's exchange rate is an important variable because trade reacts to its fluctuations and these fluctuations alter the structure of prices and thus incentives in trading activities which affect the whole economy. Exports of developing countries decline with exchange rate movements while exports of developed countries remain unaffected (Mukherjee and Pozo, 2007). For instance, *ceteris peribus*, an appreciation of a country's nominal exchange rates enhances the incentive to consume imports while reducing the incentive to produce exports and substitutes for imports.

The effect of exchange movement also varies from region to region, where Latin America and Africa portrays higher exposure to exchange rate movement while there is low exposure in Asia. Empirical studies record a higher exchange rates volatility in developing countries of Latin America and Africa than in Asia. Also, volatility in developing countries is four times that of developed countries. Other studies have found that the magnitude of volatility depends on the degree of flexibility of the exchange rate regime, such that countries operating flexible exchange rate regimes experience twice the volatility experienced in countries operating hard pegs or fixed regimes regardless of their development status (Calderon, Chong & Loayza, 2002).

Overall, developing countries exhibit three times more exchange rate volatility than their developed counterparts. The higher exchange rate volatility in developing countries is mainly due to lack of management resources, and where the resources exist to relieve the risk effects, in the short run, they are too complicated and not all round hence limited in

their functions. Application of such tools is also hindered by their cost especially to small firms and particularly in the face of high volatility (Hutchet-Bourdon & Korinek, 2011).

The unexpected losses associated with exchange rate volatility cause exchange rate risk which discourage production and this affects the volume of trade. Therefore, unless traders hedge themselves in the forward market, they have to bear exchange rate risk on commitments to pay or receive foreign currency in the future. The predictability of the exchange rate is therefore important to exporters and importers because their actions are ultimately decided based on the value of domestic currency and its volatility.

Among the reasons why a country's real exchange rate (RER) can move upward is the appreciation of the nominal exchange rate, the depreciation of other countries' currencies, or a greater rate of domestic inflation rate relative to a foreign counterpart. The remedy to lost price competitiveness would be reduction of domestic inflation rate, or currency depreciation as a compensation for its relatively higher costs. However, inflation is not the only reason for ER adjustment in developing countries. For instance, Policy makers in developing countries may be aligning the domestic economy to changes in the international market such as a decline in export earnings which negatively affect the balance of payments.

Policy makers have had extensive debate over what should be the suitable level of a country's exchange rate. A multilateral agencies standard posits that the level of a country's exchange rate should be such that it favors growth of exports, and is consistent with normal

and expected capital flows over the medium term current account position, whose management does not call for extensive trade regulations or a reduced level of economic activity (Bird 1998). However, it is important to appreciate that the adjustment programmes that ensued after 1973 explain why majority of the developing countries depreciated their nominal exchange rate. On average, significant real exchange rate depreciations took place in the mid-1970s to early 1980s as a requirement of accessing international credit by the International Monetary Fund (IMF) amid resistance from developing countries. Between 1973 and 1981, depreciation of the exchange rate was a policy condition in almost 50 percent of International Monetary Fund (IMF) supported programmes (Csermely 1994).

On their side, developing countries habitually preferred dealing with the consequences of currency overvaluation through fiscal simulation of devaluation, reduction of imports through tariffs and other quantitative restrictions, while encouraging exports through subsidies. In addition, they preferred deflation of domestic aggregate demand to lower imports relative to exports, or adoption of foreign exchange controls. More so, it was common for multiple exchange rate policies that distinguished imports from exports according to their price elasticities. The adoption of a fixed exchange rate by Chile in mid-1979 provides the best example of the consequences where overvaluation coupled with persistent high inflation, led to an estimated 15 per cent rise in imports, and a 5 per cent fall in exports by 1981 (Bird 1998).

While on average exchange rate overvaluation in Africa is lower than the levels witnessed in the early 1980s, majority have maintained appreciated exchange rates by as much as more than 10 per cent. However, there has been reduced resistance towards adoption of the flexible exchange rate regime and an increasing number of them abandoned fixed exchange rates over time. Proponents of the flexible exchange rate argued that a currency devaluation improves the current account position, and was a superior policy instrument given the alternatives such that, if devaluation was costly other forms of adjustment were even worse. The multinational agencies therefore persistently promoted devaluation as currency overvaluation correction tool. This led to developing countries abandoning currency pegs and adopting some form of flexible exchange rate regimes in form of crawling pegs (Bird 1998).

A respectable strategy prescription for developing countries with rapid inflation rates was exchange rate-based stabilization. Overvaluation was seen to move the economy away from activities of foreign exchange earnings. Particularly, it was argued that it can negatively affect the agricultural sector which forms the economic pillar of majority of low-income developing countries, and forms the bulk of the non-tradable sector. This is because overvaluation creates a disincentive to the production of both tradable (exports) and non tradables. Thus, food imports in many countries became cheaper than domestic output. In most African countries, the prices in real terms received by exporters declined due to overvaluation. Considering developing countries are small and have little influence on international price of their primary exports, they could affect the domestic currency equivalent of its exchange earnings through appropriate exchange rate policies. An

overvalued exchange rates in developing countries also gave rise to parallel foreign exchange market where large illegal foreign exchange markets operated alongside the official markets, and drained away the official financial market of scarce foreign currency, for instance in Tanzania and Burma. This would call for foreign exchange rationing which is not only administratively complex but would also lead to super-normal profits for the few licensees of foreign exchange (Csermely 1994).

In order to access funding under the IMF's structural adjustment programmes and the World Bank's structural adjustment loans, developing countries carried out major currency devaluations. The resistance moved however to the size of the currency depreciation with the IMF and World Bank generally favouring a greater than the concerned governments preferred level of devaluation. Majorly, the reluctance to devalue was politically driven, because the largest cheap food imports were urban beneficiaries and their incomes were protected by trade unions. Additionally, although a currency correction by depreciation was necessary the longer the overvaluation existed the more difficult it was politically. Despite the resistance, noticeable depreciations have been implemented among African countries for instance Zaire in 1983, Ghana in 1984. Ghana achieved depreciation by use fiscal proxy for devaluation through import taxes and export subsidies. Uganda's exchange rate adjustment involved the use of transitional multiple exchange rates. Modern international dynamics that have further supported devaluation include the Franc Zone crisis in 1994, Mexican peso crisis in 1994/95, and the East Asia currency crises in 1997/98, all of which led to large devaluations. These happenings therefore, provide a basis to further the debate on the assessment of exchange rate policy in developing countries.

1.1.1 Types of Exchange Rates

Exchange rate can be stated as nominal exchange rate when inflation effects are embodied in the rate, or real exchange rate when inflation influences are excluded in its computation. The exchange rate can further be expressed as either bilateral or multilateral. A bilateral exchange rate refers to the exchange rate of one currency, say the Kenya shilling, in terms of another, for instance, the US dollar (Copeland, 1989). On the other hand, a multilateral exchange rate is the rate of one currency against a weighted composite basket of that country trading partners' currencies. It is referred as Nominal Effective Exchange Rate (NEER) when it is not adjusted for inflation, and Real Effective Exchange Rate (REER) if it is adjusted for inflation. Fluctuations in the multilateral exchanges rates specifically REER is the focus of this study because it is a good proxy for a country's competitiveness. This is because Kenyan trade with European Union is denominated in more than one currency, and hence, the need to focus on the composite basket of several currencies. Therefore, the use of exchange rate subsequently in this study refers to REER except where specific reference is made to the exchange rate.

The movement of the exchange rate can be traced to vast literature whose seminal work is Dornbusch, (1976) who argued that given a macroeconomic shock such as monetary policy, exchange rates exhibit higher volatility relative to other macroeconomic variables. The adjustment process of such a shock under the Dornbusch framework brings forth several current currency features. First, a monetary shock account for short run exchange rate fluctuations in the form of a depreciation. Second, the resultant prices rise due to monetary shock maybe accompanied by an exchange rate appreciation. The two results

explain the contrasting behaviour of the exchange rate in the short run and in the long run. Several attempts have been made therefore, to explain the exchange rate movement in the short term, medium term and long term.

The arbitrage conditions especially those associated with risk-adjusted uncovered interest parity (UIP) are the favored beginning point of assessing movements of RER. The UIP condition compares risks (ex-ante) adjusted nominal rate of return with foreign currency assets and domestic assets. Nonetheless, the condition only helps in clarify the path of change that the RER follows back to equilibrium by tracking down the RER rate of change instead of the level. The UIP approach has some problems which include the unavailability of values of future exchange rate. Further in situations that they are predicted their predicted values are not sufficient; in addition, there is failure in predicting fluctuations of the exchange rate. Whereas the shift in the equilibrium exchange rate is a likely failure in detecting UIP, purchasing power parity proposes a constant equilibrium real exchange rate. PPP claims that in different countries the price should be the same for similar goods and services, when stated in the same currency. However, PPP does not hold in reality especially in cases where there is violation in any of the assumptions. Studies that have applied PPP include Ndavi, (2012), Musyoki Pokhariyal and Pundo, (2012), and Coudert and Couharde, (2008) among others.

The behavioral equilibrium exchange rate (BEER) is the most preferred technique because it utilises a modelling approach that incorporates RER fluctuations over a period. Short run equilibrium dynamics are empirically captured, while the long run fundamentals measured

to their foreign counterparts are assumed to be related to future RER. While the real interest differentials is the foundational equation, the adhoc way of incorporating a small set of economic fundamentals has been the main source of criticism. Studies that have applied this method include Ali, Ajibola & Omotosho, (2015) and Kiptui & Ndirangu, (2015), among others.

The most popular as a medium term approach is the fundamental equilibrium exchange rate (FEER) which endeavors in making right some of the BEER problems. This approach estimates an exchange rate that is in line with macroeconomic equilibrium in the medium term. These estimations are both partial equilibrium models and full scale macro econometric models. The earlier is more frequent where profits and dividends, and net trade interactions are identified and the current account is computed by assuming actual level of the real exchange rate and trend output both home and abroad. The cyclical factors therefore result to the trend current account and actual current account differential. The real exchange rate that reconciles the trend current account is the estimated FEER. The major shortcomings of this estimated FEER is that in the short run it is impossible to involve neutrality hence, what matters is the dynamics at work but such dynamics may not be available depending on the model used to calculate the FEER. Secondly, FEER modelling is primarily founded on flow equilibrium which does not incorporate stock equilibrium in the long run. The FEER method has been applied by among others Imam & Minou, (2011) and Olimov & Sirajiddinov, (2008).

The permanent equilibrium exchange rate (PEER) and the natural real exchange rate (NATREX) are among the approaches that let the exchange rate to fluctuate in the long term. The PEER approach stands out because it can be extracted directly from the BEER values. Studies that have adopted PEER include Palic, Dumicic & Sprajacek, (2014), Chen & McDonald (2012), and Kiptoo, (2007). Because the rates of macroeconomic fundamentals prevailing may arguably depart from their long run levels in the BEER and FEER, estimating their long run behavior is of paramount importance. PEER is the equilibrium values gotten from such estimates and the total misalignment is obtained by the difference between the actual RER and the real PEER estimates. The BEER approach was adopted for this study because it captures the medium to long term effects. Policy makers according to Gonzalo & Granger, (1995), are more interested in the trend (permanent) behavior whereas businessmen are interested with the transitory exchange rate characteristics.

The variability of exchange rates affects international trade as a risk which takes the form of exchange rate volatility. Exchange rate volatility is defined as the short-term exchange rate variation which is measured by the conditional variance of the exchange rate and is believed to hinder growth of trade. In developing countries, exchange rate volatility is believed to be an indication of economic policy mismanagement which leads to damaging effects on international trade.

Mwangi, Mbatia, and Nzuma (2014), defines exchange rate volatility as the degree to which exchange rate moves up and down with respect to its mean. It also represents the risk associated with the unexpected fluctuations of the exchange rates. Volatility includes the general movement (variability) and the unpredictable aspect of that movement (uncertainty). Interest rates, inflation, the economic state of a country, current account position, foreign domestic investments, capital flows, and advancements in technology are some of the variables which have been known to contribute to exchange rate volatility (Hook & Boon 2000). Cote, (1994) defines volatility as the magnitude to which prices of currencies tend to fluctuate over time. It is this magnitude that encompasses the uncertainty associated with unpredictable fluctuations in the exchange rates. From a theoretical point, exchange rate volatility is a source of risk and uncertainty with a negative impact on risk averse traders, thus reducing international trade volumes.

There are two circumstances in which flexible exchange rates can be considered as highly volatile. One, they can be consistent with the macroeconomic fundamentals while still responding extremely to disturbances on such variables after which they steadily adjust to a new long-term equilibrium level. This 'overshooting' may arise due to the slow prices adjustment of the goods and services markets, while the capital markets internationally correct almost instantaneously to disturbances (Dornbusch, 1976). Second, they primarily may be affected by influences unrelated to the macroeconomic variables. In such instances, movements in the exchange rate would be largely random in the short run (Musyoki Pokhariyal & Pundo, 2012). Over time however, exchange rate volatility that is a result of the macroeconomic fundamentals leads to exchange rate misalignment.

Exchange rate misalignment is represented by the deviation of the real exchange rate from its long run equilibrium path which distorts the comparative advantage, which is the core of the Ricardian theory of international trade. Arize, Osang, and Slottje, (2008) argue that failure to include a variable that captures the influence of exchange rate risk such as exchange rate volatility or misalignment in a study of the determinants of international trade may yield biased and potentially misspecified results.

According to Edwards (1997) definition, the gap between the exchange rate and its equilibrium level and which is unobservable is the exchange rate misalignment. The exchange rate of a country can be overvalued or undervalued if it appreciates or depreciates over or under its equilibrium path. Misalignment therefore is described by the two conditions. An exchange rate is considered to be in equilibrium or ideal when there is simultaneous internal and external balance in the economy. Although, the actual exchange rate commonly deviates from the equilibrium level due to short run frictions and adjustment costs in the short and medium run, some of these deviations can overtime persist resulting to misalignment. Exchange Misalignment is associated with markets where actual exchange rate is not allowed to adjust to change in the underlying economic fundamentals. Principally, the causes of exchange rate misalignment are unsustainable monetary and fiscal policy alongside unsustainable trade and exchange control policies.

A correctly aligned exchange rate is an important issue in developing countries where their chief foreign exchange earner is agriculture and is therefore the engine of the economies especially in terms of employment. While the manufacturing sector in these countries are

protected by government, their agricultural enterprises remain largely exposed. This problem can be compounded when currencies in developing countries become overvalued reducing the profitability of agricultural tradables therefore, is seen to negatively affect agricultural performance. Therefore, a steady exchange rate is a key variable in the growth of trade a country's trade. Essentially, the economic underperformance of Sub-Saharan Africa has been blamed on exchange rate misalignment (Toulaboe, 2006). Therefore, the main concern should be the level of the real exchange rate of a country relative to its equilibrium level in the long-run. However, there is general consensus, that any variance from this equilibrium level leads to substantial welfare loss, economic agents gets incorrect signals and can eventually lead to instability in the economy. The starting point as suggested by Sidek, (2011) is to estimate the exchange rate misalignment and then us the estimated variable of misalignment in the export and import models model.

It is argued that the RER misalignment of a country has a dual effect. While it can enhance the profits to traders, it can also be an incentive to non-traditional and potential goods of exports that may encounter increased barriers of entry due to a disproportionately highly valued currency Calamitsis, Basu and Ghura, (1999). Compared to an undervalued exchange rate, an overvalued exchange rate is considered a bigger threat to an economy. Imports are encouraged while export are undermined in an overvalued exchange rate environment, because competitiveness is lost by reducing the incentives of the importing country to import. If this situation persists, exports decrease relative to imports. This resultant increase in imports requires additional foreign exchange and may lead to increased borrowing to cater for the reducing foreign exchange reserves. Thus, it is key to

determine particularly when an overvaluation of the exchange rate occurs as this is considered the main cause of economic damage.

Existing literature suggests that one important indicator of a country's economic vulnerability is exchange rate misalignment. A persistent exchange rate overvaluation is regarded as a precursor to a crisis and also reflects unsustainable macroeconomic policies in the economy. On the other hand, a persistent undervaluation could bottle the economy to overheating, which exerts pressure on domestic prices and misallocation of resources between tradable and non-tradable sectors. Despite the key role equilibrium exchange rates play in economic growth, research is concentrated on developed economies or carried out as a post crisis analysis. Rodric (2008) posits that, it is by carefully crafting an exchange rate undervaluation that China, Taiwan, Tanzania and Uganda seem to have resolved or cushioned themselves against the weak institutions constraint. Although most countries outside the Sub-Saharan Africa have dealt well with overvaluation, generally the exchange rate is usually overvalued due to inappropriate and inconsistent policies.

A World Bank (2012) study indicates that while a stable undervalued exchange rate is a viable policy for economic growth in developing countries, maintaining the policy long enough can have negative repercussions and therefore is not a sufficient condition. The objective therefore should be to keep the exchange rate as close as possible to its equilibrium level. The experience from the high performing East Asian "success stories" countries shows that a sound exchange rate induced competitiveness is one of the "winning strategies" in an export oriented world. Further, these countries launched their successful

economic development by avoiding overvaluation of the exchange rate. Their economic status however, contrast sharply with countries in the Sub-Saharan Africa which have not been able to sustain the growth of trade and therefore forms a basis of investigation.

Empirical findings on how trade is affected by exchange rate volatility have been contradictory. According to Cote, (1994) such findings are attributed to the period of the sample used, models applied, measures of volatility, and the state of development of the economy under consideration. Proponents of the view that high volatility depresses trade claim that naturally, merchandise and services are expressed in foreign currency (the exporting or importing country) in the international markets. Consequently, exchange rate uncertainty is expected to negatively affect trade on the supply side through uncertain input prices or affect importer confidence on the demand side. Other empirical studies argue that exchange rate volatility actually improves trade especially if the traders are risk takers such that they are able to cover their risks by hedging. Empirical studies on the relationship between exchange rate volatility and trade is scarce concerning developing countries and where it is available, the effect is negative. What is not in dispute from literature albeit from developed countries only, is that volatility directly affects trade through uncertainty and adjustment costs (Cote, 1994; Pickard, 2003).

1.1.2 Factors that Influence Exchange Rate Movement

The most important concern is whether a country’s exchange rate is in line with its long-run equilibrium level because there are significant welfare costs associated with maintaining the real exchange rate at this "wrong" level. That means economic agents

receive incorrect signals which may results in economic instability. The short-term behaviour of exchange rates during the floating rate period has seen volatility as much as five times compared to the Bretton Wood's era (Frenkel & Goldstein, 1989). The variability has also been marginally greater and unexpected over time. These features show that exchange rate variability is not a regime transitional issue but volatility should be judged based on the behaviour of the underlying economic variables. That is, how exchange rate changes in response to unexpected movements in the driving variables (Frenkel & Goldstein, 1989).

Exchange rate variability can be evaluated through the costs of this variability on the targets of exchange rate policy such as growth, consumption, inflation, trade among other targets. According to the proponents of this strand of argument, a highly variable and unpredictable exchange rate is costly because it inhibits the volume of international trade. The changes in a country's competitiveness can sometimes be justified by real economic events such as technological progress, and movements in terms of trade. Such changes which are justified are an equilibrium phenomenon in which policy intervention is not necessary. In other cases, there is a disequilibrium change due to unjustified departures of the actual real exchange rate from its equilibrium level known as real exchange rate misalignment (Edwards, 1989).

Edward, (1989), argues that while the operational definition of the real exchange rate is given by:

$RER = \frac{EP_T}{P_{NT}}$ where *RER* is the real exchange rate, *E* is the exchange rate, P_T is the world price of tradables (proxied by whole sale prices), and P_{NT} is the price of non-tradables

(proxied by domestic price index). The equilibrium *RER* exists when the relative price of tradables to nontradables is such that it leads to a simultaneous internal and external equilibrium. An Internal equilibrium exists when the non-tradable goods market is currently clearing and is expected to be in equilibrium in the future. On the other hand, and external equilibrium means the sum of the current account in the current period and the future expected current account satisfies the intertemporal budget constraint. The intertemporal budget constraint states that the value of the discounted current account balance has to be equal to zero.

This definition by Edwards (1989), means that a country's exchange rate can be affected by variable changes that affect the country's internal and external equilibriums. These include: world price of exports; import tariffs, and real interest rates. In addition to real exchange rate, all the real variables that determine a country's internal and external equilibrium are called real exchange rate fundamentals. Their current as well as their expected future values affect the real exchange rate equilibrium (Edwards, 1989). The external fundamentals include: international terms of trade; international transfers, foreign aid flows; and the world real interest rates. The internal fundamentals are categorized into decisions related policy and those that are unrelated to policy. The policy related fundamentals include import tariffs and quotas, export taxes, exchange and capital controls; and composition of government expenditure. The non-policy fundamentals include technological progress.

Tariff or trade subsidies lead to major effects on the equilibrium real exchange rate. An import tariff for instance implies an increase of the domestic price of importables, hence reducing their demand. This increased domestic price of importables encourages demand for nontradable goods therefore raising their price. In addition, variations in the terms of trade affect the equilibrium real exchange rate such that a deterioration in the terms of trade have a similar effect as an imposition of a tariff. Capital controls affects intertemporal consumption such that a relaxation allows capital inflows that results to higher expenditure on all goods, including nontradables hence increasing their price hence real exchange rate appreciation. An international transfer to the rest of the world reduces both the current and future domestic real income and expenditure hence a fall in the relative price of nontradables or a real depreciation. It seems always, the RER has to depreciate in order to make a transfer to the rest of the world. Conversely, an international transfer from the rest of the world, generates a real exchange rate appreciation.

Ceteris paribus, and given a certain level of taxes, any increase in government consumption must be financed by non-tax resources such as increased foreign debt or foreign aid. This increases the demand for home-produced goods leading to a real appreciation of the currency. Private sector spending is greatly reduced by an increase in tax revenue hence reduced demand and the price of domestic goods relative to foreign goods hence depreciating the exchange rate. According to Balassa (1964), if productivity due to technological progress in the traded sector grows more rapidly than productivity in the non-traded sector in the domestic economy, the relative price between traded and non-traded goods has to fall raising the general domestic price level hence the RER appreciates.

Over time, researchers have considered more fundamental determinants of exchange rate in their studies. Theoretically there is a positive correlation real price of oil and the real exchange rate according to Lugaiyamu (2015). Because oil imports cannot be substituted by domestic residents with other locally produced sources of energy, disposable income is reduced by an increase in the price of oil, consequently the demand for domestic goods falls which leads to a decline in the level of prices hence the real exchange rate depreciates. The level of net foreign assets (NFA) affects the current account in two ways that are opposing. One, an adverse association between NFA and the current account can exist where a country remains solvent due to high NFA that leads into trade deficits for a longer term. Secondly, there is higher net foreign income flows that accrue to economies with high NFA hence the NFA and current account balances are positively related.

As indicated earlier, real exchange rate misalignment leads to welfare and efficiency costs. A World Bank, (1984) report argues that, real exchange rate misalignments especially overvaluation stemming from exchange and trade controls greatly hurts exports and can crash the agricultural sector if maintained for long periods. In addition, RER misalignment can lead to capital flight, which although may be optimal from a private perspective, it leads to a welfare loss. The objective of the policy makers therefore, should be to keep the exchange rate as close as possible to its equilibrium level.

The effect of exchange rate movement is unavoidable and very influential in an economy. In addition, a persistent overvaluation of the real exchange rate, distorts allocation of resources away from productive activities, ultimately leading to major alterations in the

relative prices of imports and exports and hence depressed aggregate economic growth. A persistent undervaluation can bottle the economy to overheating. Nevertheless, the direct empirical link between exchange rate misalignment and international trade requires to be fully investigated.

1.1.3 Kenya's Exchange Rate and Trade Policies

Kenya's financial market, the goods markets, and the foreign exchange market were liberalized in the 1990s. However, it was a gradual movement to a floating exchange rate regime from a fixed to a floating exchange rate regime. The liberalization in independent Kenya began in 1963 to 1982 with a fixed exchange rate regime, 1983 to 1993 was a crawling peg period, and in 1993 a floating exchange rate regime was eventually embraced. The balance of payment crisis of 1971 and 1972 and the need to conserve foreign exchange made the institution of exchange rate controls necessary (Ndung'u 1999). A dual exchange rate that lasted up to 1993 was preceded by a crawling peg period that lasted from 1982 to 1990. An abandonment of the dual exchange rate was however triggered by the exchange rate misalignment. The environment of floating the exchange rate was characterized by enormous depreciation such that in 1993 there were three episodes of exchange rate devaluation.

Kenya's trade policy can be categorised into four periods of transitions and reforms since independence. First, 1960-1970s post-independence era saw the import substitution that sought imports replacement with locally produced goods. This period was biased towards exports via heavy regulatory and protectionist policies, and the provision of incentives in

key sectors of the economy. The import substitution policy was credited for the resultant growth of exports and a steady growth between 1964 and 1973 (Were, Sichei, & Milner 2009).

The 1980s signals the first liberalization attempts which were implemented through the Structural Adjustment Programmes (SAPs) fronted by the Bretton wood institutions. The external shocks of the 1970s had exposed the import substitution regime weaknesses. For instance, protection rates, foreign exchange controls, import licensing, bureaucratic and cumbersome administrative procedures and an overvalued currency, discouraged the growth of non-traditional exports. This led to the reduction in Kenya's economic growth and called for a different trade strategy. The chief aim of the liberalization was, to reorient the protected domestic market to a more competitive economy that would expand exports. The SAPs therefore were focused on elevation of non-traditional exports, market liberalization, and reforming the regulations concerned with international trade. Some of the outward oriented strategies included the export compensation schemes in 1974. The key features of the SAPs included reduced tariffs among other methods aimed at protecting the agricultural and manufacturing sectors, and liberalization of the financial sector.

The third epoch in the (1990s) was characterised by sixth development plan of 1989 – 1993 which was majorly export oriented. The policies were focused on expansion of export via institutional reforms, reduction and restructuring of tariffs, export duties were abolished, export retention schemes were introduced, foreign exchange and insurance regulations improved, and the establishment of the National Export Credit Guarantee Corporation

(Africa-Europe Faith and Justice Network, 2015). To stimulate investment, improve efficiency, and increase foreign exchange earnings, several incentives were introduced to address bottlenecks faced by exporters. These included Manufacturing Under Bond (MUB) in 1988, Export Processing Zones (EPZ) and the revival of the Kenya Export Trade Authority (KETA) in 1990, and establishment of the Export Promotion Council in 1992.

As a response to the balance of payments crisis in 1971-75, Kenya maintained exchange rate controls well into the 1990s. The controls were considered an easy remedy to use in containing the balance of payments and inflationary pressures. However, the 1970s controls generated major distortions in the economy which came to the fore in the early 1980s. These included accelerated growth of money supply and paradoxically inflation. The economic environment characterized by severe imbalances in the major macroeconomic variables particularly high domestic prices and unstable exchange rate, was not conducive for reforms especially financial stability. In the early 1970s, the chronic instabilities were brought to the fore by the excess liquidity associated with the general elections of 1992, when the money printing press was set loose. The financial sector reforms of 1993 set into motion attempts to contain the problem. When the excess liquidity was mopped up, inflation responded although sluggishly, the exchange rate appreciated and the interest rate started to track domestic inflation down creating room for liberalization. After much devaluations, the official exchange rate act was repealed in 1993 to allow the market forces to determine the exchange rate (Ndungú 1999).

The last development strategy was introduced by the National Rainbow Coalition (NaRC) - Kenya's Economic Recovery Strategy for Wealth and Employment Creation (ERS, 2003) that blended into the current Trade policy 2009. The objectives of the ERS were among other things: high economic growth; improved equity, poverty reduction; and improved governance. The National Trade Policy 2009 is founded on the World Trade Organization (WTO) market-driven principles of liberalization and based on the importance of regional economic integration blocs which Kenya is a signatory among them the East African Community (EAC), the Inter-Governmental Authority on Development (IGAD), and the Common Market for Eastern and Southern Africa (COMESA). The instruments in these agreements are the bedrock of Kenya Trade Policy 2009 especially on imports and exports. The National Trade policy is also linked to Kenya's development framework, the *Vision 2030* which seeks to make Kenya a globally competitive and prosperous country with a high quality of life by the year 2030. One objective of the Kenya Trade Policy 2009 is to promote and expand Kenya's exports through value addition in the service and manufactures sectors. This has been achieved considerably through continued decline of tariffs and non-tariff barriers in the country's export markets (Gitonga, 2015).

In summary, a country's real exchange rate is important since it influences the price of domestic in relation to foreign goods and services. One key objective of Kenya's economic reforms was to reduce real exchange rate misalignment, since real exchange rate misalignment is generally believed to be a major cause of poor economic performance. Real exchange misalignment discourages exports and the production of importables (Mwega, 2014).

1.1.4 Kenya's Trade with European Union

By 2016, Kenya's overall key export destination was Africa accounting for 40.6 percent of total exports. The leading exports include tea, coffee, horticulture, articles of apparel and clothing. Approximately half of Kenya's exports to Africa go to the Est African Community. Exports amounting to 24.5 percent of the total exports went to Europe with the bulk of it destined to EU. Asia has remained a dominant single source of Kenya's imports accounting for 66.8 per cent of total imports in value, in 2016 (Republic of Kenya 2017). Kenya's key imports comprise of motor cars and parts, medicine for both animals and humans, agricultural chemicals, rubber, steel and iron products, veterinary goods, fuels and lubricants, computing equipment, electrical and electronic equipment's are sourced from EU as the largest market of origin. The Kenya- EU trade is second only to COMESA by rank. In the EU market Kenya's primary export destinations include France, Germany, the United Kingdom, and the Netherlands. EU imports from Kenya include primary agricultural goods such as fruits, vegetables, and cut flowers that account for approximately 90 percent of total exports value. Others include tobacco, tea, coffee, fish, sugar, handicraft, textile and clothing among others.

The non-reciprocal agreement (Cotonou, 2000) allowed the EU to maintain preferential access to the European market by the African, Caribbean and Pacific (ACP) countries, in return for reduced customs duties for European exports. For the East African Community member countries, this agreement formally came to a close in 2014 and was supposed to be succeeded by the Economic Partnership Agreements (EPAs). This new agreement seeks to establish a Free Trade Area (FTA) between EU and ACP countries in their economic

groupings. The ACP countries are required to open up their markets to EU products while putting into considerations their diverse needs and differentiated levels of development. Based on this arrangement, countries were expected to open up market access only when they were ready.

The year 2014, marked the end of the non-reciprocal trade arrangement between EU and its ACP partners. This trade framework guided by Yaoundé, Lomé and Cotonou agreements ended in 2007, when the World Trade Organization terminated the second waiver. This waiver had permitted the EU to use differentiate trade engagements with the ACP partners from the other developing countries. Consequently, it was a requirement for ACP countries for the first time to engage in reciprocal, though asymmetric trade agreements, with a developed and major trading partner while their regional integration agendas were basically in a formative stage. It was expected that the objectives of the EPAs were to be negotiated at a regional level as development tools in building strong regional markets, enhancing trade and investment, facilitating the integration of ACP economies in the global economy as well as motivating deeper economic reforms. Second, they were meant to ensure unlimited, immediate and fully liberalized ACP market access to the EU market and open the services market. Over time it was also envisaged that EU goods and services would gain significant market access in the ACP countries. Ultimately, is was expected that the EPAs would use a business model framework unlike the ACP-EU arrangement.

It was evident to the least developed ACP partners that there was likely to be no meaningful gain considering they had had full EU market access since 2001. They also feared losing import duty revenues, unfavourable competition from European agriculture which is subsidized and crowding out of small businesses from an already weak manufacturing sector due to competition from Eurozone products. They were also faced by a no deal with the EU that meant they would have been rendered worse off by competing with all other developing countries in the absence of Cotonou preferences. By the close of 2014, ACP EPA parties had risen to 49 from 36 in 2007 out of the 76 ACP negotiating countries. Out of the 27 countries that decided to stay out, 12 are in the Pacific while 15 are in Africa. The latitude of the agreement was revised to include trade in goods only with a commitment to include services negotiations in future. Compared to the ACP-EU agreement, the EPAs included more products, and a relaxation of the rules of origin allowed countries to source products from neighbouring countries and transform them locally and still qualify for exports to the EU (World Bank, 2012).

However, the EPAs have also had challenges because possibilities favour some regions more than others, failure to address administrative customs cooperation. Further, liberalisation was to be phased over at most 25 years, and due to sensitivity of agricultural products, the sector was not subject to liberalisation. At the EAC the EU expects the member states to sign up as a block. Burundi having had strained relationship with EU has refused to sign, Tanzania has backtracked on signing the pact signing citing loss of revenue and growth of domestic industries, Uganda has argued that the pact would strain the regions relations, meaning only Kenya and Rwanda have committed to the agreement.

Despite the envisaged gains from the ACP-EU and the proposed EPAs, these agreements do not consider the nature of trade in commodities and the outcomes of such market openeness on developing countries. Kenya's trade flows for instance present a unique production structure in agriculture and manufacturing sector where agricultural exports are primarily bound to the EU while the industrial goods headed to the EAC COMESA and rest of Africa. This means Kenya exports raw agricultural goods with very little value to its economy and to a fixed menu of countries. For instance, between 2005 and 2009, 43 percent of Kenya's total merchandise exports comprised of agriculture, dairy and meat, and sea-food products while the list of markets has not changed much (World Bank, 2012).

The EU being a key market for Kenyan exports and a source of her imports and considering the goods are quoted in terms of either USD or the Euro the role of the exchange rate in these transactions cannot be ignored. The complete liberalization of the exchange rate in 1995 to follow the forces of demand and supply for the local currency means that it is under constant fluctuations against the currency of trade destination. Considering Kenya's trade goods are mainly agricultural products exports are particularly prone to exchange rate fluctuations.

1.1.5 Kenya's Exchange Rate Volatility, Misalignment, and trade

Being considered as the risk associated with exchange rate movement, the various exchange rate regimes since independence have traces of exchange rate volatility. At independence in 1963 to 1982, a period that corresponds to the fixed exchange rate regime, the East African shilling was pegged to the US dollar. Similarly, upon established of the

Central Bank of Kenya in 1965, the Kenya shilling was pegged to the US dollar up to 1982. Typical to developing countries characterized by high inflation, this period was characterized by an exchange rate overvaluation and loss of competitiveness of Kenya's exports. The policy makers used tariffs and other quantitative restrictions to reduce imports, encouraged exports through subsidies and adopted foreign exchange controls to conserve foreign exchange.

The Multinational agencies promoted devaluation as a tool of correcting currency overvaluation. This led to developing countries abandoning currency pegs and adopting some form of flexible exchange rate regime in form of crawling pegs and Kenya adopted a crawling peg from 1983 to 1993. This period saw massive devaluation with the exchange rate being devalued three times in 1993. One of the reason of devaluation was to reduce inflation and also to access funding under the IMF's structural adjustment programmes and the World Bank's structural adjustment loans meaning the Kenya eventually adopted in 1993 a floating regime. There was increased volatility of the exchange rate from 1982 to 1990 when crawling peg was being implemented. Exchange rate volatility creates uncertainty in trading activities making risk averse and risk neutral exporters to cut down in their decision making. This led to reduced exports while imports increased. Policies such as foreign exchange controls import licensing, bureaucratic and cumbersome administrative procedures and an overvalued currency geared towards imports substitution worked against the non-traditional exports growth.

Exchange rate misalignment which characterized the period of the dual exchange rate from 1990 to 1993 led to the official exchange rate being abandoned. The adoption of the flexible exchange rate was expected to raise the price of exportables relative to the price of non-tradeables, thereby motivating exports through the interplay of market forces of demand and supply for foreign exchange. The unabated growth of foreign exchange reserves due to increased capital inflows led inflationary pressures and a real exchange rate appreciation (Mwega, 2014).

Further an environment of massive devaluation characterized the period of floating the exchange rate and particularly the exchange rate was devalued three times in 1993. The expectation through the J- curve phenomena is that the devaluation would have stimulated trade balance through improved exports. Bahmani-Oskoee and Gelan, (2006) argue that, although the J-curve phenomenon has been tested for both developed and developing economies, African countries have not received attention in this regard. Kenya's economic development is largely dependent on the external conditions that affect the economy via the international trade. Further, the economy is small and her trade represent a sizeable share of GDP reported at 36.18 percent in 2018 with a recommended ratio of at least 80 percent (World Bank, 2012). Concerning goods, exports have had an average annual growth rate of 10 percent compared to her peers, such as Vietnam, which exhibit a relatively high and consistent year on year export growth trajectory. Contrastingly, Kenya's export growth trend has been characterised by volatility, with a positive pattern followed by poor performance. In addition, the domestic market is not sufficiently large to support

large scale production and therefore depends on imports to sustain part of the domestic consumption.

Figure 1.1 shows the trend of Kenya's exchange rate and trade balance with EU between January 2000 and 2016. This period is important because the ACP-EU Partnership Agreement was signed in 2000 for a 20-year period covering 2000 to 2020 and allowed non reciprocal access of ACP goods to the EU market.

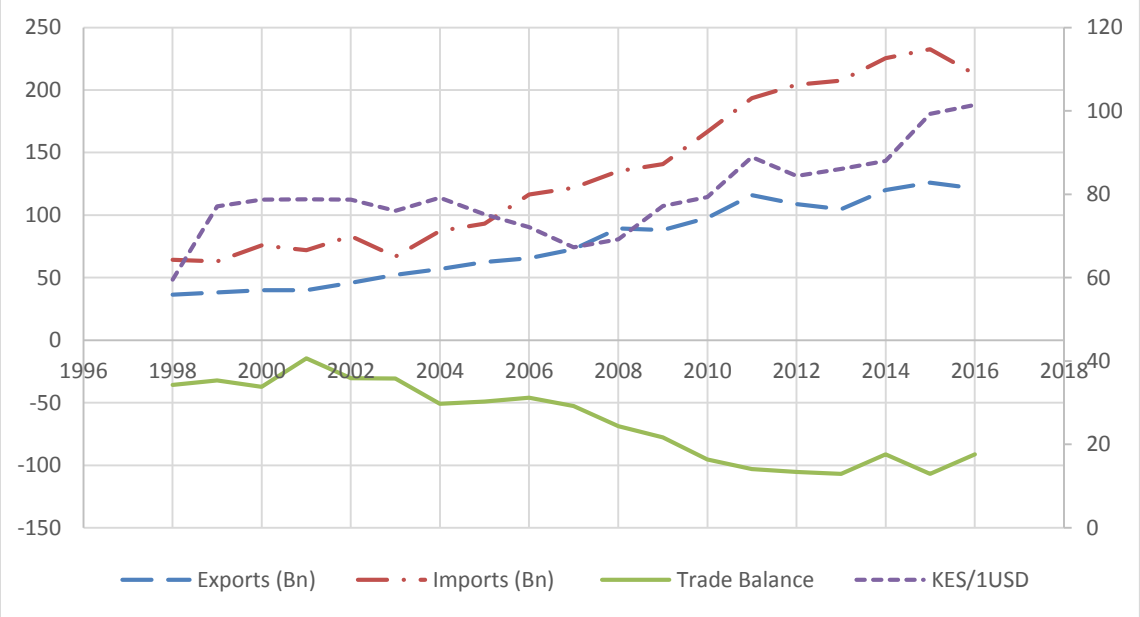

Figure 1.1 Kenya's Exchange Rate and Trade Balance With EU

Source: Author's compilation using data from Central Bank of Kenya statistics (2000-2016)

Between 2000 and 2004 imports and exports between Kenya and EU moved closely together. Imports from the EU dipped in 2003 due to slowed growth in the Euro region from 0.9 per cent in 2002 to 0.5 per cent in 2003. The effect of the fiscal and monetary stimulus was apparently low in the Euro area compared to United States of America (Republic of Kenya 2004).

Although both exports and imports increased between 2004 and 2008, the trade deficit also widened in 2006. The trade deficit stood at 0.82 percent of the GDP in 2004 and grew to 10 percent in 2012 according to the Central Bank of Kenya. This could be explained by a boost of household spending due to an improved labour market that saw unemployment drop by 8 percent since 2001. Transport and communication were the largest gainers with massive roll out of new and improvement of existing facilities. The mobile subscriber grew by 36.5 in 2006 (Republic of Kenya 2007). Beyond 2009 imports accelerated and the trade deficit between Kenya and EU expanded more. The growth of exports in 2010 can be attributed to Spain, Italy, Belgium and United Kingdom markets where exports increased by 34.9, 34.6, 22.7 and 4.5 per cent, respectively in 2010. As a single market, the exports to the EU rose by 7.3 per cent and accounted for 24.1 per cent of the total export earnings in 2010 partly due to increases in horticultural, and fish exports and increased global prices (Republic of Kenya 2012). However, this could not match imports of aeroplane and other aircrafts, electrical generating sets and rotary converter that tripled in 2010. The value of imports from France rose by 17.4 percent while imports from Germany rose by 16 percent (Republic of Kenya 2010). There is a notable dip in exports in 2013 which is explained by a fall in international prices for tea, coffee and horticultural products. The poor weather pattern also led to a fall in the total value of marketed output in tea, cut flowers, fruits and coffee (Republic of Kenya 2014). The country's export structure has remained constant over time with same raw agricultural goods exported and to a fixed set of countries.

Between 2000 and 2004 Kenya's exchange rate stabilized at around 80 KES/USD. This was trailed by a 15 percent appreciation from 2004 to 2007 when the annual average dropped from 79.2 to 67.3 KES/USD. The improved macroeconomic environment of 2004-2007 that characterized the NARC government can be attributed to the KES appreciation of the Shilling which reduced Kenya's competitiveness and encouraged imports to compete with local output. A depreciation from 2008 onwards followed this appreciation particularly attributed to the 2007/08 global financial crisis among other external shocks. In 2011, the exchange rate appreciated briefly due to a gradual monetary policy tightening which was aimed at stabilizing the exchange rate (Republic of Kenya 2012). In 2014 the shilling weakened against the USD by 2.1 percent. This depreciation happened against a fall in oil prices, increased Diaspora remittances and an injection of USD 2 billion in the economy from floating of the Eurobond. According to Republic of Kenya (2015), the depreciation was due to the strengthening of the US Dollar; declining international visitors that deteriorated tourism earning; and a widening trade deficit. A country's vulnerability is normally amplified by concentration in agricultural exports such tea, fruits and vegetables, coffee and flowers. For a given merchandise imports, Kenya's oil imports account for over 20 percent of total, the increase in oil prices in the world market could have been transmitted to domestic prices hence depreciating the local currency (Kiptui & Kipyegon, 2008).

According to Kiptui and Kipyegon (2008), Kenya's terms of trade remained fairly stable in the period preceding year 2000, declined by 2.6 percent between 2001 and 2005. Notably the terms of trade deteriorated further by 3.8 percent between 2005 and 2006. The capital

inflows were on average lower in 2000 to 2005 and rose from 2006 onwards. The degree of openness expressed as the ratio of total trade to GDP rose from 37.99 percent to 40 percent in 2003 and rose to 47.34 percent in 2005. This implies that external factors influenced the movements in exchange rate and therefore the trade balance such that increased capital inflows and increased oil prices contributed to the exchange rate depreciation. These factors are also the main determinants of exchange rate risk in the form exchange rate volatility.

The period between 2000-2016 saw the exchange rate appreciate and depreciate at various times. Oiro, (2015) argues that these episodes were accompanied by wild fluctuations of the exchange rate, leading to the high exchange rate volatility, mainly driven by inflation and trade deficit. Other researchers observed who observed that Kenya's exchange rate has been misaligned with changing extents include Kiptui and Kipyegon, (2008). The growth of trade deficit at the same time of exchange rate depreciation indicates a considerable pattern concerning exchange rate movement and trade. The pattern of trade between Kenya and EU also reflects the current account balance of the country.

One objective of this study is to examine real exchange rate movements to determine if it is aligned to its fundamental determinants. The real exchange rate is a key measure of a country's trade competitiveness, and therefore, an overvalued currency adversely affects exports. Besides, if misalignment persists, it can activate a crisis in the balance of payments (Kiptui & Ndirangu, 2015).

1.2 Statement of the Problem

One of the export oriented policies introduced from 1990s to early 2000s and incorporated in the Sixth Development Plan (1989-1993) was liberalization of the exchange rate. Their main objective was to transform the economy from inward looking to outward looking through trade competitiveness. In addition, through the Cotonou Agreement (2000), Africa Caribbean and Pacific (ACP) group of countries were granted non-reciprocal access to the EU market between 2000 and 2020. As emphasized by the Kenya Vision 2030, Kenya considers the successor of the ACP, the Economic Partnership Agreement (EPA) as a critical trade opportunity (Republic of Kenya, 2007). This is also echoed by the Kenya trade policy 2009 in which one of the broad objectives is to promote and expand Kenya's exports (Republic of Kenya, 2009). However, these export oriented efforts notwithstanding, Kenya's trade deficit deteriorated from 0.82 percent in 2004 by accelerating to 10 percent of GDP in 2012.

Figure 1.1 shows that in different episodes, the Kenya shilling fluctuated noticeably: it was stable between 2000 and 2004 at around 80 KES/USD; a 15 percent appreciation from 2004 to 2007 beyond which a depreciation ensured since 2008. Studies by Kiptui and Kipyegon (2008), and Kiptui and Ndirangu (2015), show that 2000 and 2012 was characterized by varying degrees of the exchange rate misalignment, while Oiro (2015) classified 2000 to 2004 as a period of low exchange rate volatility and 2005-2012 as a period of high volatility.

This presents evidence that KES/USD fluctuated between 2000 and 2016 and considering the investment and trade risks that the exchange rate fluctuations presented in the international trade there is need for investigation. During the same period Kenya's overall terms of trade deteriorated by (0.6%) between 1994 and 2000, (2.6%) between 2001 and 2005, and by 3.8 percent between 2005 and 2006 (Kiptui & Kipyegon, 2008). Kenya's trade with EU has been in deficit which rose to KES 50.9 billion in 2004 from KES 37.3 billion in 2000. The deficit widened further to KES 68.7 billion in 2008 and reached KES 103 billion in 2011. The described scenario negates the main objective of liberalization of the exchange rate among other efforts which were to orient the economy outwards through exports growth. The main policy dilemma is therefore how imports have accelerated in an environment of unhindered EU market access through the ACP agreement, and liberalization of the exchange rate whose aim was to improve exports. Given this problem and considering that trade between Kenya and EU is expressed in USD, there is need to investigate the relationship between KES exchange rate and her trade with EU.

There exists empirical research in this area by Oiro, (2015), Musyoki, et al. (2012), Akwabi (2015), and Ogutu (2014) who found that exchange rates influence trade. Further, they found that there was exchange rate volatility in different periods. However, only a handful have studied how exchange rate volatility affects Kenya's trade flow. Further, the studies have not focused on trade flows where the partners have an agreement which is not based on reciprocity. It is this gap that this study therefore attempts to fill.

1.3 Research Questions

The main aim of the study was to answer the following research questions:

i. What is the extent of Kenya's exchange rate misalignment?

ii. What is the effect of exchange rate misalignment on bilateral trade flows between Kenya and EU?

iii. What is the effect of exchange rate on trade balance between Kenya and EU?

1.4 Research Objectives

The main objective of this study was to investigate the effects of exchange rate misalignment on Kenya's bilateral trade flows between Kenya and European Union. The specific objectives are:

i. To establish the extent of Kenya's exchange rate misalignment;

ii. To determine the effects of exchange rate misalignment on bilateral trade flows between Kenya and EU;

iii. To determine the effect of exchange rate on trade balance between Kenya and EU.

1.5 Significance of the study

This study attempts to fill the information gap on how trade between Kenya and EU is affected by the exchange rate and its misalignment and recommend policy measures. The study will benefit Central Bank of Kenya and Ministry responsible for Trade in making policies that enable them steer the country in managing trade within bilateral and multilateral trade agreements. Considering that the common tool of choice to alleviate the adverse effects of exchange rate variabilities on export growth is exchange rate policy, this

study is likely to assist policy makers in making sound decisions concerned with the performance of the exchange rate policy with a view to improve exports as envisaged in Kenya's vision 2030. An informed exchange rate policy will become a basis through which exporting agents negotiate for conducive macroeconomic conditions that assist them in organizing their export activities.

1.6 Scope of the Study

Quarterly data covering the period 2000 – 2016 was utilized in this study. Further the study used Kenya exports to five key EU members (UK, Germany, Netherlands, France and Belgium). These include tea, coffee, vegetables, fruits and cut flowers as the major exports. The imports from four key EU member states (UK, Germany, Italy and France) include rubber, plastics, refined petroleum, iron/steel plates, fabricated metal products, machinery, vehicles (other than railway), pharmaceutical products, electrical and electronic equipment, beverages arms and ammunition, fertilizer, aircrafts and spacecrafts. The choice of countries was guided by availability of trade data for the period before 2000. The period of study 2000-2016 was guided by the availability of reliable data during the period and the ACP and EU trade framework which covered the period 2000 - 2020. Kenya enjoyed non-reciprocal trade arrangement with EU based on the Cotonou EU-ACP 2000 agreement during this period.

1.7 Organization of the Study

This study is organized as follows: Chapter One introduced the background, statement of the problem, research questions and objectives, significance, and scope of the study. The theoretical and empirical literature review is presented in Chapter Two, while research design, methodology and the theoretical framework to be used, the model specification, data sources and analysis are presented in Chapter Three. Study analysis results are presented in Chapter Four. Finally, a summary of the study, conclusion and policy recommendations are provided in Chapter Five.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents theoretical and empirical literature on the relationship, as well as how exchange rate misalignment effects trade. Section 2.2 provides the theoretical literature on the real exchange rate-trade nexus while an overview of the literature reviewed is provided section 2.4.

2.2 Theoretical Literature Review

2.2.1 Theory of Purchasing Power Parity

Among the main theories of exchange rate determination is the theory of purchasing power parity (PPP). The theory states that in different countries if they are expressed in one currency, the prices for the same goods and services should be the same. Hence, the ratio of the prices of goods and services in the two countries should be equal to the nominal exchange rate. This theory has two versions- absolute and relative- expressed as equation 2.1 and 2.2:

$$E_{1,2} = \frac{p_1}{p_2} \qquad 2.1$$

$$e_{1,2} = p_1 - p_2 \qquad 2.2$$

Where $E_{1,2}$ – is the exchange rate between countries 1 and 2, p_1 is the price of goods and services in country 1, p_2 is the price of the goods and services in country 2. In equation 2.2, e is the rate of change in the exchange rate, p_1 and p_2 are the respective rate of change of the prices of goods and services in countries 1 and 2. The absolute purchasing power parity in equation 2.1 holds when the ratio of the prices of goods and services of the two

countries is equal to exchange rate between countries 1 and 2. In equation 2.2, the relative purchasing power parity holds when the exchange rate is equal to the difference of prices between the two countries. Differing results have been fronted by researchers with some arguing that the theory generally holds while others argue that, it only holds in the long run despite existing in both short and long run. The general consensus however, is that PPP may not hold due to the following: the consumer price indices may not be the same in country 1 and 2; free trade between country 1 and 2 may be inhibited by protectionist policies; country 1 and 2 maybe of unequal economic status (developed or developing); the price elasticities can be different in country 1 and 2 for the same goods; and which index between consumer prices and producer prices should be used. Although the model is simple and uses very few variables, these shortcomings limits its application.

2.2.2 Theory of Interest Rate Parity

This theory is based on the argument that, when valued in the same currency, the return on assets should be equal in different countries. That is, if relative to home country assets the interest rate paid for foreign assets relative is higher, then price of the home country currency should be higher than the price of the foreign currency. The central proposition of the theory of interest rate parity therefore states that when low yielding currencies should get more expensive, the high yielding currencies must get cheaper, and speculators would seize the arbitrage opportunity that would ensue. Interest rate parity exists in two forms: covered, and uncovered interest rate parity. In case of covered interest rate parity, changes in the future exchange rate compensates for the difference between the price of home currency compared to foreign currency and the interest rate yield such that:

$$1 + i_t^1 = (1 + i_t^2)\frac{F_t}{S_t} \qquad 2.3$$

Where i_t^1 is the interest rate in home country 1 and i_t^2 is the interest rate in foreign country 2 at time *t*, respectively, and F_t is the price of the future contract, and the nominal exchange rate at time *t* is expressed as *St*. Under uncovered interest rate parity however, instead of a future contract, a possible future exchange rate is used.

$$1 + i_t^1 = (1 + i_t^2)\frac{S_{t+1}}{S_t} \qquad 2.4$$

Where S_{t+1} is the possible exchange rate in time t+1. Although it is a necessary condition for efficient foreign exchange market, the uncovered interest rate parity rarely holds. Deviations from parity exists due to: investors irrationality; inappropriate data; sluggish investors adaptation; varied investor beliefs; bubble composition, and the acquired risk caused by deviation from uncovered interest rate parity.

2.2.3 The Monetary Theory -Flexible price monetary model.

Flexible price models, also known as asset model were introduced due to the non-performance of the Mundell-Fleming model especially in high inflation situations. In its broad form the model is expressed as:

$$\boldsymbol{s = (m_1 - m_2) - \propto (y_1 - y_2) + \beta(i_1 - i_2)} \qquad 2.5$$

Where s is the exchange rate, m_1 and m_2 is the money supply in country 1 and 2 respectively, y_1, and y_2 are incomes in country 1 and 2 respectively while $i_1 - i_2$ is the interest rate differential between country 1 and 2.

The monetary theory states that, the exchange rate is a ratio of the prices of currencies of two different countries, determined by the supply of and demand for the currencies.

According to the theory, the exchange rate relates positively to relative money supply and interest rate, and inversely related to the income differential of the two countries. The model however, just like the Mundell-Fleming model cannot explain all the exchanges rates volatility. The model also assumes that the exchange rate adjusts at the same time with changes in the macroeconomic variables. This however, does not happen in the real world. The limitations of the flexible prices model gave rise to the sticky price or exchange rate overshooting model.

2.2.4 The Monetary Theory - The Dornbusch Sticky Prices Model

This model was introduced by Dornbusch, (1976), as part of the monetary theory models. The model posits that in the presence of an expansionary monetary shock, the exchange rate overshoots in the short term and revert to its long run equilibrium path in the long run. The model is used to explain high rates of observed exchange rate volatility. The model assumes a small economy operating in a flexible exchange rate, with sticky short term prices in the goods market and rational expectations. Given a monetary policy change such as an increase in interest rate, the goods and financial market adjust to the new equilibrium. However, equilibrium is reached first in the financial market since prices are sticky in the goods market. Ultimately, when the goods and services prices progressively respond to the new equilibrium, the exchange rate changes again i.e. overshoots in the short run creating excess volatility. The model can be derived as:

$m_t - p_t = \gamma y_t - \theta i_t$ domestic money market equilibrium 2.6

$m_t^* - p_t^* = \gamma y_t^* - \theta i_t^*$ foreign money market equilibrium 2.7

$s_t = p_t - p_t^*$ purchasing power parity (PPP) 2.8

$i_t - i_t^* = E_t s_{t+1} - s_t$ uncovered interest rate parity (UIP) 2.9

Where:

m_t and m_t^* is the domestic and foreign money supply, p_t and p_t^* is the domestic and foreign price levels, y_t and y_t^* is the domestic and foreign incomes, i_t and i_t^* represent domestic and foreign interest rates, and s_t is the nominal exchange rate all in their natural log. $E_t s_{t+1}$ is the expectation of s_{t+1} at time t, γ is the income elasticity of demand, and θ is the coefficient of adjustment of the present exchange rate to its long term price. Combining 2.6 and 2.7 and substituting the PPP yields:

$$s_t = m_t - m_t^* - \gamma(y_t - y_t^*) + \theta(i_t - i_t^*) \quad 2.10$$

Let $F_t = m_t - m_t^* - \gamma(y_t - y_t^*)$ represent domestic and foreign countries money supply and prices respectively. Substituting UIP into 2.10

$$s_t = F_t + \theta(E_t s_{t+1} - s_t) \quad 2.11$$

Assuming rational expectations and no bubble solution s_t can be solved as:

$$s_t = \frac{1}{1+\emptyset}\sum_{j=0}^{\infty}\left(\frac{\emptyset}{1+\emptyset}\right)^j E_t\left[\sum_{j=0}^{\infty} F_{t+j}\right] \quad 2.12$$

Equation 2.12 is a relationship between the sum of expected future fundamentals such as money supply shocks, money demand shocks, and productivity shocks among others and the exchange rate. F_t includes both observable and unobservable components of the macroeconomic fundamentals. This is the monetary approach foundational model used in forecasting exchange rates.

Being more advanced than the earlier models, Dornbusch (1976) model tries to expound why compared to macroeconomic fundamentals there is greater volatility of exchange rates. Among the other models the sticky price model assumes that exchange rates do not change at the same time as the underlying macroeconomic variables. This study adopted the theoretical founding of this model to estimate the equilibrium exchange rate from the identified macroeconomic fundamentals.

Siregar (2011) extended the model using the Behavioral Equilibrium Exchange Rate (BEER) approach and the concept of uncovered interest rate parity.

$$i_t - i_t^* = E_t(e_{t+1}) - e_t \qquad 2.13$$

Where e_{t+1} is the expected value of the nominal exchange rate in period *t* for *t+1* period and e_t represents the nominal exchange rate in period *t*. $i_t - i_t^*$ represents the local and foreign interest rate differential. By subtracting the expected inflation from both sides of equation 2.13 transform the nominal interest rate parity into the real interest parity.

$$(E_t(p_{t+1}) - p_t) - (E_t(p_{t+1}^*) - p_t^*) = E_t\Delta p_{t+1} - E_t\Delta p_{t+1}^* \qquad 2.14$$

leads to $Eq_{t+1} - q_t = r_t - r_t^*$ 2.15

where $Eq_{t+1}$is the real exchange rate at period t for period t+1, q_t is the observed real exchange rate, $p_t$and p_t^* are the domestic and foreign prices respectively, r_t and r_t^* are the domestic and foreign interest rates at period t, where $r_t = i_t - E_t(\Delta p_{t+1})$ and $r_t^* = i_t^* - E_t(\Delta p_{t+1}^*)$, Δp_{t+1} and Δp_{t+1}^* is the change in domestic and foreign prices respectively. From 2.15

$$q_t = Eq_{t+1} - (r_t - r_t^*) \qquad 2.16$$

This implies that the observed real exchange rate can be expressed in terms of expected real exchange rate and real interest rate differential. In other words, equilibrium real

exchange rate can be estimated from the BEER approach by incorporating long run economic fundamentals and short run interest rate differential expressed as:

$$q_t^{rer} = f(F_t, r_t - r_t^*) \quad 2.17$$

Where F_t is the observable and unobservable components of the fundamentals derived in 2.12.

2.2.5 The Elasticity Theory

This approach attempts to predict how devaluation of a country's currency affects the balance of payments, and also the ideal conditions for the devaluation. Starting from a point of balance of payment equilibrium the approach assumes that devaluation can improve the balance of payments. However, for devaluation to function successfully, the total of the price elasticity of domestic and foreign demand for imports in absolute terms has to increase. When a country devalues a currency, it improves the balance of payments under ideal conditions known as the Marshall-Lerner conditions. According to the Marshal-Lerner Condition (ML-C), the sum of price elasticity of exports and imports in absolute terms must be greater than one for a currency devaluation to have a positive impact on trade balance. Technically ML-C describes the reason why there is no automatic and immediate improvement of a country's balance of payment following a currency devaluation. As a devaluation of the exchange rate implies a decrease in export prices, they increase in quantity. Concurrently, the price of imports increases, shrinking their demand.

The final result of greater export volume at cheaper prices and less import quantities because they are more expensive is determined by the import and export price elasticity. Supposing the prices exports are elastic, proportionately the export volume demanded will exceed the price decrease, therefore growing the general receipts from exports. In a similar fashion, if imports are price elastic, the total expenditure on imports will decline. In a situation where there is elasticity in exports and imports, a currency depreciation moves the country's current account towards surplus. In the short run, the ML-C do not hold because, the imports value increase in the short term due to transactional lags ordered several months prior. After a while, traders are able to gain competitiveness from their losses in the out of the country produced goods when they correct their input strategies. This process triggers an effect in the volumes where the imports quantity decreases as domestic production rises to cover demand. During the entire process, the traded quantities adjustment responds slower than adjustments in the relative prices. The expectation is that the long term effect is a trade balance net improvement. When the net trade balance is plotted against time, devaluation produces a letter J shaped trade balance response and hence named the J-curve effect. The elasticity approach has undergone much improvements and modifications towards explaining international trade particularly in the structural economic estimation of price and income elasticities of imports.

The elasticity approach has had some form of perfection over time and is considered the most important breakthrough in the context of the impact of exchange rate on trade balance analysis. The elasticity approach has been applied more by policymakers especially where a country faces trade balance deficit as is the case in Kenya. This is because the approach

considers how imports and exports respond to a given change in exchange rate. this would help policymakers to estimate the extent to which trade balance would be affected by devaluation. Considering the elasticity approach provides this vital information it was therefore a more useful in this study particularly on the exchange rate-trade balance relationship.

In linearizing the elasticities theory, Hacker and Hatemi (2004), postulates that imports are a function of relative prices (RP) and the size of the economy (Y).

$$M_d = M_d(RP_m, Y) \qquad 2.18$$

M_d is the imports demand, RP_m is the relative price of imports, and Y is the domestic income of the importing country.

Supposing *e* is the nominal exchange rate, then the relative price of imports can be written as:

$$RP_m = e\frac{P_x^*}{p} = e\frac{P^*}{P}.\frac{P_x^*}{P^*} \qquad 2.19$$

P and P* are the domestic and foreign prices respectively, *e* is the nominal exchange rate, subscript x shows the goods were exports in the foreign country such that $\frac{P_x^*}{P^*}$ is the relative price of exports in the foreign country denoted RP_x^*. Let *E* be $e\frac{P^*}{P}$ (the real exchange rate).

Substituting in 2.19:

$$RP_m = E.RP_x^* \qquad 2.20$$

Substituting 2.20 into 2.18:

$$M_d = M_d(E, RP_x^*, Y) \qquad 2.21$$

2.3 Empirical Literature Review

Numerous empirical studies have been conducted to study the effects of exchange rate on trade using various methodologies and variables.

Santos-Paulino, (2003) evaluated the impact of trade liberalization (trade openness) on exports and imports in the Dominican Republic. The study found that the Dominican Republic had made significant progress towards opening her trade regime, chiefly through the elimination of non-tariff barriers, simplification of the tariff structure, and the reduction in the rates of duties. The results showed that, although, the export coefficient was rather higher, the effect of trade openness had almost the same magnitude on export and import.

In Pakistan, Kemal and Qadir, (2005) used monthly data from 1981 to January 2003 and Engle-Granger approach and the Johansen cointegration analysis. The dependent variables used were exports, imports, while the independent variables were exchange rate, and relative prices. The study findings were that Pakistani exports did not respond to exchange rate shocks. Further, imports were seen to respond positively to exchange rate shocks. However, the coefficient for imports was lower than that of exports. The cointegration approach adopted by the authors was appropriate since there was the same order of integration of all the variables. Nonetheless, the variables adopted for this study were integrated of different order and therefore, the most appropriate method was ARDL because it incorporates variables of different order of integration.

In examining the effect of real exchange rate volatility on exports, a gravity model was used by Chit, Rizov, and Willenbockel (2008), 25 years quarterly data, while utilising cointegration approach. The authors used home and foreign country GDP, exchange rate volatility and relative prices as explanatory variables. The authors found that there was a negative relationship between exchange rate volatility and exports in the emerging East Asian economies studied. The gravity model captures a strong pattern of international trade and provides robust results. Regarding Gravity model, some researchers have considered it theoretically weak in the face of globalization and information technology growth, countries have moved from trading with close neighbors in favour of the global market. The model is therefore considered too simplistic in a complicated international trade.

In a study on the relationship between the real exchange rate and trade balance in Malaysia from year 1955 to 2006, Ling, (2008) used a Vector Error Correction Model (VECM). The independent variables used were RER, domestic and foreign income. The study found that a devaluation improved Malaysia's trade balance. While the few variables selected may have been integrated order, use of more variable may give rise to integration of different orders. This study on Kenya used more variables and a shorter sample period and therefore ARDL approach was more suited.

Olimov and Sirajiddinov (2008), analysed the effect of exchange rate volatility and misalignment in Uzbekistan using quarterly data from 1994Q3 to 2005Q2. The study used the general error correction model. The economic fundamentals chosen were terms of trade, trade openness, government consumption, ratio of investment to GDP, GDP and a

policy dummy. The results suggest that the real exchange rate misalignment has depressing effects on exports. The results showed that import demand price elasticity is between –0.78 and –0.83. The use of the fundamentals was appropriate for this study since theory shows that exchange rates are determined by such fundamentals especially for short horizons.

Juthathip, (2009) studied the developing Asian countries using the period between 1995 and 2008, BEER method and quarterly data to estimate the equilibrium RER and misalignment. Further, the relationship between misalignment and exports was analysed. The variables utilized include: productivity, net foreign assets, terms of trade, and trade openness. The study concluded that showed that, the RER was persistently overvalued in the build-up to the 1997/98 crisis and that exports were negatively related to exchange rate misalignment. The author notes when an RER depreciation is associated with a significant misalignment, it could result in positive impact of on exports. The magnitude and significance of the coefficient increases by diversification of exports. The BEER approach has been considered a better approach since it recognizes a set of real macroeconomic fundamentals as the drivers of equilibrium RER and therefore was utilized in this study.

Naseem, Tan, and Hamizah (2009), in their investigation of the effect of real exchange rate misalignment on Malaysian import flows, used quarterly data 1991-2003. The study results showed that exchange rate misalignment positively affected imports. The study utilised natural real exchange rate (NATREX) to derive the equilibrium exchange rate, and a measure of real exchange rate volatility was derived using a GARCH model. Their results deviated from other studies since exchange rate misalignment significantly improved

imports for period of the study. From literature, the long run BEER and medium term NATREX values are highly correlated and therefore NATREX was the appropriate model for the study. The dynamic exchange rate adjustments are best explained by the NATREX only when a long time horizon is being considered. This study used a medium horizon and therefore adopted the BEER which is related to NATREX.

Sidek, (2011) divided a sample (1991Q1-2008Q3) into a high and low misalignment regime respectively. The exchange rate was estimated using a BEER approach by incorporating government expenditure, net foreign assets, productivity, and trade openness as the independent variables. The computed misalignment was incorporated alongside foreign income, and relative prices in a standard export demand equation using an autoregressive framework and estimated using least squares. The study concluded that exchange rate misalignment no significant effect on exports if it is below 8.88 percent. This study used this threshold to assess the effect of exchange misalignment.

Imbs and Isabelle, (2011) estimated the aggregate export and import price elasticities by applying a Constant Elasticity of Substitution (CES) demand system using annual data between 1995 and 2004. The study covered 28 countries stretching from developed to developing countries. The simulated study concluded that exports had a positive relationship with relative prices. Barno, Ondaje and Ngwiri, (2011) argues that this positive relationship between exports and their relative prices is possible in countries that export goods which the importing country cannot substitute easily. Kenya's exports are specialties

such as cut flowers, fruits and vegetables which are have preferential demand in EU and can be considered nonsubstitutable.

In an investigation of the aggregate import demand function for India Sultan, (2011) used Johansen's cointegration method using 1970 to 2008 sample data. The study used real imports, real income, relative price of imports and real foreign exchange reserves. The long run results showed that India's imports are income elastic, and relative price and foreign reserves inelastic. The elasticity of foreign reserves was 0.21. According to the author, foreign reserves constitute an important determinant of a country's imports, and omitting such a variable may lead to model misspecification and potentially overemphasize the influence of the other variables included in the model. Foreign reserves variable was therefore included in this study to avoid the cited potential problems.

Siregar, (2011) reviewed the most commonly applied theoretical and empirical models of equilibrium exchange rate. The considered models were the purchasing power parity theory (PPP), the fundamental equilibrium exchange rate (FEER), the desired equilibrium exchange rate (DEER), the permanent equilibrium exchange rate (PEER), the behavioural equilibrium exchange rate (BEER), and the natural rate of exchange rate (NATREX). The author notes that policy makers are interested to know whether the changes in exchange rate are permanent or transitory. The author also points that the model adopted should as much as possible be based on the issue being investigated since no one particular model is adequate. This study adopted the BEER due to its wide usage and the fact that its values and those of PEER have been found to be close. The BEER is also superior to FEER because the measure of misalignment produced by BEER relates the deviation of the actual

exchange rate to the estimated equilibrium exchange rate. Further, BEER approach uses a dynamic adjustment to the long term equilibrium level.

In their study to evaluate the effect of the real effective exchange rate on oilseed exports, Mehare and Edriss, (2012), used yearly time series data between 1992 and 2010 for Ethiopia and Bangladesh. The study utilised Autoregressive Distributive Lag (ARDL) to test for short run and long run relationship of oilseeds export and Terms of Trade, real effective exchange rate and national income. The findings were that oilseeds export were depressed by exchange rate fluctuations. Terms of trade were found to negatively affect exports, while the domestic income was found to be a non-important variable. In the short run, real effective exchange rate was found to be insignificant in the short run but significant in the long run.

In another study, Ekanayake, Thaver, and Plante, (2012) used a sample period between 1980 and 2009 and quarterly trade data to study South Africa - EU trade by employing the error-correction model and ARDL bounds testing technique to co-integration. The objective was to analyze how the real exchange rate volatility effected trade flows. The dependent variables were exports and imports while the independent variables used were income, foreign exchange reserves, relative prices of imports and exports, real exchange rate, and a measure of volatility. The authors argue that foreign reserves are not part of the traditional import demand function despite its importance. The study concluded that there were mixed short-run and long-run volatility effects on trade. Relative prices were found to negatively affect imports, while national income enhanced imports. This methodology,

variables, quarterly data and a sample of selected countries in EU was adopted in this study because cointegration has been favoured in explaining trade based on its determinants.

A similar study was carried out by Bahmani-Oskoee, Harvey and Hegerty, (2012) on the bilateral trade between USA and South Korea. The authors also used ARDL method for 96 export and 29 import industries respectively for the period 1965 to 2006. They used fewer variables (GDP, real exchange rate, and volatility) and focused on effects of exchange rate volatility on bilateral trade both in the long-run and short-run. The results showed that exchange rate volatility affected trade significantly in the short-run while there were mixed effect in the long-run. The sample period used in this study covers the fixed and floating regimes of RER. Since this study was concerned only with the floating exchange rate regime, the sample range is 2000-2016.

Musyoki, et al. (2012) sought to determine the real exchange rate misalignment in Kenya, for the period between 1993 and 2009 by employing Johansen Cointegration. The study adopted government expenditure, terms of trade, trade openness, productivity, and capital as the independent variables. The study findings were that the exchange rate was above the equilibrium level more often and that the competitiveness of country's goods weakened during this period. Considering that the liberalization of markets in Kenya took place in 1993, the results of this study are likely to be affected by lag effects. The crawling peg effects were still being felt in the economy. The same variables were used in this study but corrected for this bias by using a sample beyond the likely lag effects.

Jordaan and Eita, (2012) studied the impact of RER misalignment on South Africa's economic competitiveness, using the period 1990-2011 and quarterly data. Exchange rate, government consumption, terms of trade, trade openness, and national income were the variables used in an intertemporal general equilibrium model. A multivariate cointegration and vector auto regression was used to estimate the impact on economic performance. The findings of the study revealed that RER misalignment had a negative impact on economic performance. The study considered only one aspect of exchange rates –misalignment. This study evaluated how two dimensions of RER (volatility and misalignment) affect trade between Kenya and EU.

Lencho, (2013) studied how the Birr/USD exchange rate affected Ethiopia's balance of trade in the long run. The author used a wide range of independent variables that included, real effective exchange rate, GDP, foreign GDP, money supply, terms of trade, drought and government expenditure. The study concluded that in the long run, a 10 percent exchange rate depreciation succeeded in improving Ethiopia's trade balance by 8.3 percent. Similar results were reported by Ogutu (2014) who studies the trade balance behaviour in Kenya. This study used only RER, GDP and money supply and a sample covering 1963 to 2013. A vector error correction method was adopted together with a Johansen cointegration technique.

Irena and Andrius (2013), reviewed the fundamental theories of exchange rate forecasting. The reviewed theories include PPP, interest rate parity, flexible and sticky price models and other alternative models. The authors note that among the models, the sticky price model reflects the reality where the exchange rate fails to adjust simultaneously at the same

time with other macroeconomic variables. This study adopted sticky price model since it is applicable to small economies under flexible exchange rate regimes.

Rutto and Ondiek, (2014) sought to investigate the extent to which exchange rate volatility affects performance of Kenya's tea exports by applying the cointegration and error correction technique. The study utilized 1970-2008 annual time series data and employed cointegration and error correction technique. The study results indicate that, tea exports were negatively affected by a volatility risk. The sample used in this study cuts across the fixed and floating exchange rate in Kenya and therefore the results ought to have been separated for the different exchange rate regimes. The authors used annual data and therefore had only 36 observations. The Johansen and Juselius cointegration has its weakness in small samples and therefore this study adopted the ARDL.

Trinh, (2014) used ARDL modeling approach and data ranging from 2000 to 2010 to investigate the effect of exchange rate on trade balance in Vietnam. The independent variables used were REER, GDP and foreign GDP. An exchange rate depreciation (positive REER coefficient) improved the trade balance in the long run while domestic income had a negative effect on trade balance. The ARDL approach was adopted for this and more variables were included to avoid misspecification.

Suleman Cheema, Riaz, Yousaf and Shehzadi (2014), investigated the exchange rate-trade balance relationship between Pakistan and Saudi Arabia by using a 1973 to 2010 sample. The authors found the variables used had mixed order of integration where some were I(0)

and others I(1). ARDL approach to cointegration results did not support the existence of the J-curve hypothesis. This study used variables of mixed stationarity and ARDL bounds testing technique due to its advantages over especially with short samples.

Ibrahim, (2014) examined the effects of real exchange rate misalignment on imports and exports in Nigeria between the year 1960 and 2013. The study used the behavioural equilibrium exchange rate (BEER) technique to estimate the equilibrium real exchange rate. To analyse the effect of misalignment on exports and imports, a single equation cointegration method was used. The study found that between 1960 and 1985 Nigeria's real effective exchange rate was above its long run level, and below between 1986 and 2013. The real exchange misalignment was found to have no effect on exports but had a negative effect on imports.

Belloumi (2014) examined trade, FDI and economic growth relationship in Tunisia using an autoregressive distributed lag model and bounds testing between 1970 and 2008. The bounds tests suggest that the variables of interest are bound together in the long run when foreign direct investment is the dependent variable. The authors concluded that Tunisia can be compared to other developing countries in terms of attracting FDI and trade liberalization. Among other cointegration techniques, there are several advantages that favour the ARDL. The variables used can be integrated of I(1), I(0) order or fractionally integrated. Further, ARDL is more robust with small and finite samples. In addition, the obtained long run estimates are not biased and the dynamics both the long run and short

run can simultaneously be obtained. Finally, the ARDL is considered dynamic because it allows the various variables to have different lags.

Using time series data, Zakaria (2014) analyzed empirically the effects of trade liberalization on exports, imports and trade balance in Pakistan between 1981 and 2007 using quarterly data. The preferred estimation approach was the Generalized Method of Moments (GMM). The author concluded that trade openness enhances both exports and imports with the effect being greater on latter than on former thereby worsening the trade balance. Such results are typical of developing countries whose economic size is inferior to their trading partners and also lack of diversification of export goods. Trade openness moves trade in favour of the bigger economy and considering developing economies are import dependent, any attempt to liberalise trade leads to increased imports. The study also found negative effect of terms of trade on exports demand hence the trade balance.

Mwega (2014), sought to investigate the over-valuation of Kenya's real exchange rate after adoption of a floating exchange rate regime. The study used quarterly data 1995Q1-2012Q1. The author argues that equilibrium real exchange rate is an unobservable variable and has to be indirectly obtained from the underlying macroeconomic variables. The macroeconomic variables considered were: terms of trade, net capital inflows, trade openness proxied by severity of tariffs, government expenditure and economic growth. The exchange rate misalignment was estimated using MIS = (ERER-RER)/RER*100. The study observed no significant deviation of the real effective exchange rate from the estimated equilibrium rate. While the study used strong macroeconomic fundamentals recommended by

economic theory, the sample considered was too close to the dual exchange rate regime and therefore the results could be biased.

In studying the relationship between real exchange rate, tax revenue, foreign income, government consumption, and oil, Lugaiyamu, (2015) used the period 1987-2012 and applied granger-causality in Tanzania. Findings of the study show there is no relationship between Tanzania's exchange rate and the considered determinants in the long run but there were mixed significant short run effects. In Nigeria, Odili, (2015), studied the effect of exchange volatility on imports between 1971 and 2011 using co-integration and error correction model. The study findings revealed that exchange rate volatility depressed imports.

Kiptui and Ndirangu, (2015) using quarterly data sample ranging from 2000 to 2014, used the BEER approach to study misalignment in Kenya's real exchange rate. A vector error correction model (VECM) was used and the estimate results showed that the equilibrium RER is closely associated to its long run equilibrium level. Usually, the unit root of the data used are unknown and therefore ARDL model is the most appropriate in empirical work. According to the sticky price model, exchange rate does not adjust at the same moment with changes in the underlying economic variable. A dynamic model was therefore more appropriate for this study. The BEER approach has several advantages over other variant exchange rate determination approaches. First, BEER approach has the potential to capture all the fundamental movements of the exchange rates; second, by using time series in a single equation the BEER technique is highly tractable; and third, the

exchange rate misalignment values produced using BEER are free from normative elements. The BEER approach was therefore found to be the most appropriate technique to estimate equilibrium exchange rate.

Chirchir, Muse and Jagongo, (2015), studied how tea exports to Kenya's key destinations were affected by exchange rate volatility using ECM for the period 2008-2012. The independent variables used were domestic prices of tea, the price of coffee as substitute to tea, and an exchange rate volatility variable. The measure of volatility was determined using a GARCH approach. The authors used a Generalised Method of Moments (GMM) estimation method. The investigation revealed that an increase in volatility had a more that proportionate decline in the tea exports demand. The values obtained through a GARCH method are based on past values measured as a linear function of past errors and therefore is more preferred.

In their investigation on the effect of trade liberalization on exports and imports in Syria over the period 1980–2010, Mohsen, Chua, and Sab, (2016) used trade openness as an indicator of trade liberalization. The cointegration test shows no long-run causality relationship between trade openness and imports. The authors conclude that although trade openness enhances both imports and exports they do not necessarily need to increase.

In estimating the effects of the real effective exchange rate on real export earnings of Bangladesh both in the short run and long run, Hassan, Chakraborty, Sultana and Rahman (2016), used time series data for the period from June 2003 to May 2015, cointegration

techniques, and the Error Correction Model (ECM). The estimation results showed that there no significant effect on export in the short run earnings but in the long run REER had significant effect. One cause of insignificance in this study could be attributed to misspecification of the model and also the sample size. This current study used a dynamic model to try and overcome this problem.

In their review of cointegration techniques, Nkoro and Uko (2016), argues that economic theory assume a long run relationship exists between variable. The authors posit that according to research, time series data does not possess the normally assumed constant mean and variance and that this problem ought to be resolved. Further, the authors argue that Engle and Granger (1987), ARDL and Johansen and Juselius (1990) cointegration techniques are the most popular. In reality most time series data is non stationary and therefore, the traditional Ordinary Least Squares diagnostic statistics become highly misleading and unreliable. The Engle and Granger cointegration is not applicable when variables have different integration order and only Johansen and Juselius, and ARDL can be used on such variables.

Sharrif and Ali, (2016), analysed the main determinants of trade balance in Somalia using real effective exchange rate, foreign direct investment, and inflation rate as independent variable for the period between 1970 and 2010. The preferred estimation method was Ordinary Least Square method. The estimation result revealed that only foreign direct investment was a significant variable of Somalia's trade balance. The other determinants of trade balance used were found to be insignificant.

In analysing how imports are effected by trade openness in EAC countries, Gaalya, Edward and Eria, (2017) used panel data cointegration approach that utilised the Fully Modified Ordinary Least Squares and Dynamic Ordinary Least Squares. The study considered real effective exchange rate, domestic income and relative prices of imports as the explanatory variables. Annual panel data for the period between 1994 and 2012 was used for the study. The findings showed that the domestic income positively affected the import demand at both the aggregate and disaggregated levels of imports.

2.4 Overview of Literature

The reviewed literature concentrated on three exchange rate aspects namely the determination of equilibrium exchange rate, extent of misalignment, and the effect of exchange rate risk in the form of misalignment on exports and imports.

Literature on estimation of exchange rate misalignment shows that, the generally used determinants of exchange rate: net foreign assets, productivity, terms of trade, trade openness, money supply, and government expenditure. In addition, the most preferred technique is the Behavioral Equilibrium Exchange Rate (BEER). Authors who adopted BEER technique include: Juthathip (2009), Sidek (2011), Ibrahim (2014), and in Kenya Kiptui, and Ndirangu (2015). The literature reviewed shows that exchange rate movements in terms of volatility affects a country's imports and exports. There is general acknowledgement from the sizeable range of studies that trade is affected ambiguously by exchange rate movement. For instance, Sharrif and Ali, (2016) reports that real effective exchange rate (REER) has no effect on trade, while Hassan, (2016) finds that REER affects trade significantly. Concerning the exchange risk in form of misalignment, Juthathip

(2009) found that a negative effect on exports, while Ibrahim (2014) found no significant effect on export although it had a negative effect on imports. Sidek (2011), found that exchange rate misalignment had no effect on exports, while Mehare and Edriss (2012), found negative effect on trade. A careful analysis of the findings of the reviewed literature shows that the ambiguous results can be attributed, in part, to differences in methodology, the period of the sample and estimation techniques.

The review also shows that most of the reviewed studies are concerned with developed economies and few in developing countries, particularly Kenya. For instance, Kiptoo (2007), Kiptui and Kipyegon (2008), Musyoki *et al*. (2012), Mwega (2014), Rutto and Ondiek (2014) who investigated how tea exports were affected by exchange rate volatility, while Kiptui, and Ndirangu, (2015) estimated the exchange rate misalignment,. Others include, Oiro (2015), who studied the effect of exchange rate volatility on tea, coffee and horticulture exports to EU, Musyoki *et al.* (2014), investigated effect of exchange rate and economic growth. Several issues emerge in the literature, one, is that studies on exchange rate-trade relationship are rare in Kenya, and two, the application of ARDL bounds test to cointegration analysis as the model of choice due to its strength over other cointegration methods. The biggest strength of ARDL is the consideration that exchange rate and trade are determined by their past and present values and therefore ARDL modeling technique is considered dynamic. The BEER is considered as a more empirical equilibrium approach which captures short run dynamics.

It is therefore clear from literature reviewed that, estimation of the level of exchange rate equilibrium is the first step of understanding how exchange rates affects trade. Further, it is evident that studies on how exchange rate risks in the form of volatility and misalignment affect trade is scanty in developing countries particularly in Kenya. The studies which have been carried out extensively in developed countries and the few in developing countries have found mixed results. Concerning the exchange rate relationship with trade balance, the application of ARDL has not been used extensively in developing countries. The exchange rate has also not been treated as a key determinant in crafting of trade agreements between developing countries and their mostly economically bigger partners. It is these gaps that this study sought to fill by investigating how the exchange rate affects trade flows between Kenya and selected countries of the European Union within a framework where Kenya had a nonreciprocal trade arrangement.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

Chapter three comprises of the research design, theoretical framework, model specification, definition of variables, data sources and analysis.

3.2 Research design

The aim of this study was to investigate how Kenya's bilateral trade with European Union was affected by the real exchange rate misalignment. The study will adopt non-experimental research design. The non-experimental research design utilized quarterly time series data for the period between 2000 and 2016. The research design was adopted because the study intended to evaluate how exchange rate affects trade flows between Kenya and EU without any control variables. Further, this study assumed that international trade agents evaluate future trade patterns based on previous trading levels and therefore periods lags are important factors to them. To be able to incorporate the dynamic nature of this decision making of trade agents, the ARDL modeling approach bounds testing was adopted based on Nkoro and Uko, (2016).

3.3 Theoretical Framework

The study utilized sticky prices monetary theory to estimate the equilibrium exchange rate and the elasticities approach in analyzing the effect of exchange rate misalignment on trade flows as well as investigating the effect of exchange rate on trade balance. These theories are linearised in section 3.3.1, 3.3.2 and 3.3.3, respectively.

3.3.1 Determination of Equilibrium Exchange Rate

Following the sticky prices monetary theory equation 2.17, researchers use a small set of macroeconomic fundamentals outlined in the background to define Z_t. These include terms of trade, trade openness, technological changes, government expenditure, and real interest rate. Centered on the stock-flow consistent model, the link between macroeconomic fundamentals and the real exchange rate takes the form:

$$rer^* = f(tot, prod, gov, open) \quad 3.1$$

Where tot is the terms of trade, prod is technological changes as a proxy for productivity, gov is government expenditure, and open is trade openness. $rer^*$is the estimated real exchange rate proxied by real effective exchange rate. This study adopted these variables together with others identified in literature.

3.3.2 Real Exchange Rate Misalignment and Trade Flows

Equation 2.21 is analogous to the international trade's modified two-country standard model which relate imports to relative prices of imports, domestic real income and foreign exchange reserves. The foreign exchange reserves show how export earnings can cover import demand since export earnings are a major source of foreign reserves. This can therefore be expressed as:

$$M_d = M_d(E, RP_x^*, Y, FX) \quad 3.2$$

In a similar fashion the foreign country's demand for imports (the domestic exports) can be expressed as:

$$M_d^* = M_d(E, RP_x, Y^*) \quad 3.3$$

3.3.3 The Real Exchange Rate and Trade Balance

Expressing the trade balance as a ratio of exports and imports derived in equation 3.2 and 3.3:

$TB = \frac{M_d^*}{M_d}$ and assuming constant value of RP_x^* and RP_x then:

$$TB = TB(E, Y, Y^*) \quad 3.4$$

The Monetarist argue that increases in the money supply (MS) propel real balances above levels that economic agents consider optional, leading to increased expenditure for a given income hence stimulating imports and reducing the trade balance. Keynesian economists however, argue that increases in the money supply stimulate increased absorption by reducing interest rates therefore reducing the trade balance. The income and substitution effects in the elasticity theory are a consequence of the effect of deterioration of terms of trade on domestic absorption and therefore trade balance. Equation 2.28 can therefore be rewritten with the two additional variables.

$$TB = TB(E, Y, Y^*, MS, ToT) \quad 3.5$$

This is the reduced equation of a country's trade balance depends on real exchange rate, domestic and foreign incomes in a direct relationship. Trade balance is considered positively related to the real exchange rate since an increase in RER improves the price competitiveness of home country's goods relative to foreign country's goods. An increase in national income causes domestic imports to increase so the trade ratio decreases.

3.4 Empirical Model Specification

3.4.1 Determining Kenya's Exchange Rate Misalignment

Two steps were followed to derive exchange rate misalignment,: first was the estimation of equilibrium RER following the developed theoretical framework in equation 3.3.1:

$$reer_t^* = f(tot_t, prod_t, gov_t, open_t, nfa_t, tar_t, oil_t) \quad 3.6$$

Due to the use of semi logs, the model can be specified in its multiplicative form as:

$$reer_t^* = \beta_0 nfa^{\beta_1} prod^{\beta_2} e^{\beta_3 gov_t} e^{\beta_4 tar_t} e^{\beta_5 oil_t} e^{\beta_6 open_t} e^{\beta_7 tot_t} e^{\varepsilon_t} \quad 3.7$$

Where *tot* is the terms of trade, *prod* represents improvement of productivity due to technological change, *gov* is government expenditure, *open* is the degree of trade openness, *nfa* is the net foreign assets, *tar* is tax revenue and *oil* is the world brent oil prices.

The computation of the exchange rate misalignment (Mis) was the second step involved which followed Mwega (2014):

$$Mis = \frac{(ERER - REER)}{REER} * 100 \quad 3.8$$

Where *ERER* is the equilibrium real exchange rate and *REER* is the real effective exchange rate.

3.4.2 The Effect of Exchange Misalignment on Trade Flows

The misalignment variable developed at equation 3.8 is incorporated in equation 3.2 and 3.3 respectively. From literature reviewed, the degree of trade openness (Open) was found to influence the level of imports and exports such that:

$$M_d = M_d(E, RP_x^*, Y, FX, Mis, Open) \quad 3.9$$

$$M_d^* = M_d(E, RP_x, Y^*, Mis, Open) \quad 3.10$$

Which are specified as:

$$m_t = \propto_0 Y_t^{\propto_1} RP_t^{\propto_2} Open_t^{\propto_3} e^{\propto_{4FR_t}} e^{\propto_{5Mis_t}} e^{\propto_{6REER_t}} e^{\varepsilon_t} \quad 3.11$$

$$X_t = \propto_0 Y_t^{*\propto_1} RP_t^{\propto_2} Open_t^{\propto_3} e^{\propto_{4Mis_t}} e^{\propto_{5REER_t}} e^{\varepsilon_t} \quad 3.12$$

Where M_t, X_t represent the value of imports and exports at time *t*, Mis_t denotes a measure of exchange rate misalignment.

An increase in real income increases imports holding prices and tastes constant and therefore the coefficient for local income Y^{local} is expected to be positive. On the other hand, a rise in real income of the trading partner usually results to larger exports to those partners hence its coefficient is expected to be positive. The effect of exchange rate misalignment is ambiguous as shown by various studies therefore, the signs for β_3 and α_4 are the subject of the study. The real exchange rate depreciation makes imports to be expensive, so its coefficient is expected to be negative for imports and positive for exports. The coefficient for trade liberalization (openness) is presumed to be positive.

A rise (fall) of the relative price of exports makes domestic goods become less (more) competitive than foreign goods. This causes the demand for exports to fall (rise). The monetarists however, view is that changes in relative prices of traded and non-traded goods seem to improve exports. The main issue should not be the results but the transmission channel of the effects. The relative effect as a consequence of the increase in the level of directly quoted exchange rate leads to an increase in exports. Therefore, *a priori*, the expected sign of *β1*, which is a measure of Kenyan exports competitiveness relative to the world export prices will be positive. According to economic theory a rise in the relative price of imports depresses the demand for imports and therefore the expected sign of the coefficient negative. A measure of availability of foreign exchange represents the ability

of a country to import. Following Ekanayake, Thaver and Plante, (2012), higher real foreign reserves encourages imports and therefore the expected sign is positive.

3.4.3 Trade Balance and Exchange Rate

Equation 3.5 expresses the balance of trade as a function of the real exchange rate and the levels of domestic and foreign incomes. By including other variables suggested in the literature, the following estimable equation is obtained:

$$TB_t = \propto_0 FR_t^{\propto_1} Y_t^{\propto_2} Y_t^{*\propto_3} Inf_t^{\propto_4} MS_t^{\propto_5} E_t^{\propto_6} ToT_t^{\propto_7} e^{\varepsilon_t} \quad 3.13$$

The trade balance (TB) is expressed as a ratio of exports to imports to allow other variables to be expressed in logarithm form, and also avoid the need for an appropriate price index to express the trade balance in real terms. The effect of the real income on trade balance according to the absorption and monetary approaches is negative and positive respectively. Higher income levels increase import demand at the same time it increases domestic production of tradables, meaning the final effect on the trade balance is ambiguous. However, it is argued that the increased import demand effect dominates the increase in domestic production of tradable.

The effect of an increase in foreign income is ambiguous as was the case with domestic income, making the sign ambiguous. Despite this uncertainty, the sign expected is positive since an increase in income of the trading partner increases the demand for exports of the trading partner. Supposing economic agents anticipate inflation fully, then it has real economic effects since they consider it as a tax on money and hence transaction. An increase in local prices means foreigners find Kenyan goods expensive while the locals

substitute the expensive local goods with cheaper imports. The expected effect on trade balance is therefore negative. According to the Keynesian view, increases in the money supply stimulate increased absorption by reducing interest rates therefore depressing the trade balance. According to economic theory, a deterioration of terms of trade has an income and substitution effect with the net effect dependent on which effect dominates the other. The dominant view however is that deterioration of terms of trade decreases national income hence the expected sign was positive.

3.5 Definition and Measurement of Variable

Table 3.1 shows the definition and measurement of variables in equation 3.7, 3.11, 3.12, and 3.13.

Table 3.1: Definition and Measurement of Variables

Variable	Definition	Measurement and units	Expected sign
gov	Composition of government spending	Percentage of government expenditure to GDP (Ratio)	Ambiguous
prod	The value of investment as a percentage of GDP at market prices	Percentage of gross capital investment to GDP (Ratio)	Negative
tot	Terms of trade	Ratio of export price index to imports price Index	Ambiguous
Open	Trade openness	The sum total value of exports and imports divided by GDP (Ratio)	Positive
TB	Trade Balance	Expressed as a ratio of exports to imports	Ambiguous
X	Exports	The reported value of goods and services outflow in the country's statistical data (KES Billions)	Ambiguous
M	Imports	The reported value of goods and services inflows in the country's statistical data (KES Billions)	Ambiguous
$Y^{foreign}$	Foreign income	Quarterly Eurozone GDP (Billion Euros)	Positive for exports and trade balance
Y^{local}	Local income	Kenya quarterly GDP (KES Billions)	Positive for imports, negative for trade balance
REER	Real Effective Exchange Rate	Central Bank of Kenya effective exchange rate index generated using the exchange rate, CPI and a weighting matrix	Ambiguous
RPM	Relative prices for imports	Ratio of home import prices to world import prices	Negative
RPX	Relative prices for exports	Ratio of home export prices to world export prices	Positive
FX	Foreign Exchange reserves	The nominal foreign exchange reserves deflated by CPI (KES Billions)	Positive for imports, negative for trade balance
NFA	Net Foreign Assets	Sum of net foreign assets of banks and non-bank financial institutions and net foreign assets of Central Bank of Kenya (KES Billions)	Ambiguous
Tar	Tax Revenues	Tax to GDP ratio	Negative
Oil	World Oil Prices	USD per Barrel	Positive
INF	Inflation	Monthly consumer price index (CPI)	Negative
M2	Broad Money Supply	KES Billions	Negative

3.6 Data Type and Sources

Secondary, quarterly time series data 2000-2016 was used on all the variables in this study, and was obtained from World Bank, International Financial Statistics databases, various Central Bank of Kenya Statistical bulletins and annual reports, Kenya National Bureau of Statistics Economic Surveys. The sample of countries was purposively selected due to availability of reliable imports and exports data between 2000 and 2016. The data used is presented in Table A14.

3.7 Data Analysis and Estimation

3.7.1 Overview of Data Analysis and Estimation

In data analysis and estimation, the following steps were followed. Analysis of the data was done in line with the study objectives. The variables were transformed into their logarithmic form to improve their distribution by reducing presence of outliers in the data and reduces the unit of measure influence on the coefficients estimated. This assisted in the comparison of the effect of the various variables and eases estimation of parameters by producing dependent variable elasticities which are constant in relation to independent variables.

First, descriptive statistics were used to describe the data characteristics through explaining the mean, median, maxima, minima and standard deviation. Stationarity and cointegration tests were used to test for time series properties of the data. For all the objectives, the preferred model was ARDL due to its dynamic nature and appropriateness in the data used. According to Nkoro and Uko, (2016), ARDL is superior to other cointegration methods

thus: First, all the variables need not be integrated of the same order implying they can be I(1), I(0) or integrated fractionally; Second, when employing small and finite samples ARDL is more efficient; Third, ARDL produces unbiased long run estimates; Fourth, during the testing for cointegration short run and long run dynamics can be obtained simultaneously; and Finally, ARDL is a dynamic model because it allows variables to have different lags.

According to Nkoro and Uko (2016), using ARDL follows three steps. Step one involves determination of cointegration of the variables. The authors propose the bounds test for cointegration to establish the relationship between variables in the long run. Upon establishment of the long run relationship, step two calls for the choice of optimal lag length for the ARDL model. As long as a cointegration exists between the variables under consideration, and while the no long run relationship hypothesis cannot be rejected then the ARDL cointegration approach can be applied. Finding the optimal lag length is key to ensure that error terms obtained are Gaussian. Step three involves reparameterizing the ARDL model into an Error Correction Model (ECM). Researchers are mainly concerned with long run relationship between variables and therefore, specification of the ECM incorporates information for both short run and long run. (Nkoro & Uko, 2016). In all the three objectives, the Least Squares method was used to test for cointegration between variables, and the *F*-statistics for the joint significance of the lagged levels was calculated. On each objective, a bounds test was conducted and the results presented before the long run results are discussed. A variety of prescribed diagnostic and stability tests were performed Prior to adoption of the results to avoid spurious regression.

3.7.2 Time Series Properties Test

3.7.2.1 Stationarity Test

Many time series economic variables such as exchange rates, and income are characterized by non-stationarity in their mean. This type of data gives statistics which lack standard distribution which points to possible regression results which are spurious. In this study, the stationarity test was carried out using the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) since it eradicates potential low power against stationary near unit root processes associated with ADF and PP tests. The test is founded on the notion that some time series data is stationary around a deterministic trend which can be calculated by summing the deterministic trend, random walk and stationary random error such that:

$$y_t = \beta t + r_t + \mathcal{E}_t \qquad 3.14$$

Where y_t and t=1, 2…….T, βt represents the trend (deterministic), r_t is a random walk and $\mathcal{E}_t$**is** the stationary random error.

$$r_t = r_{t-1} + \mu_t \qquad 3.15$$

The first value r_0 is the intercept since it is assumed to be fixed. The behavior of the series depend on the variance μ_t,σ_μ^2 such that if the variance is equal to zero $r_t$is constant and $y_t$is trend stationary. If the variance is greater than zero then r_t is a random walk and $y_t$is non stationary. if β=0, under the null hypothesis y_t is stationary around r_0. The computed test statistics are evaluated against the critical KPSS values such that if the statistic is more (less) than the critical value given by KPSS the null hypothesis is rejected (not rejected).

3.7.2.2 Cointegration Test

According to Engel and Granger, (1987), the long-run relationship between two or more variables is checked by cointegration. As a pre-test to avoid spurious regression results therefore, a test for cointegration should be considered. There is evidence from literature of cointegration between most macroeconomic variables especially between effective exchange rates and exports and imports of emerging countries and the real exchange rate. Models (3.7), (3.11), (3.12), and (3.13) were augmented in order to implement the ARDL bound test approach as:

$$\Delta reer_j = c + \sum_{i=1}^{p} \propto_i \Delta reer_{t-i} + \sum_{i=1}^{p} \partial_i \Delta tot_{t-i} + \sum_{i=1}^{p} \sigma_i \Delta prod_{t-i} + \sum_{i=1}^{p} \delta_i \Delta gov_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta open_{t-i} + \sum_{i=1}^{p} \eta_i \Delta nfa_{t-i} + \sum_{i=1}^{p} \theta_i \Delta tar_{t-i} + \sum_{i=1}^{p} \mu_i \Delta oil_{t-i} + \lambda_1 reer_{t-1} + \lambda_2 tot_{t-1} + \lambda_3 prod_{t-1} + \lambda_4 gov_{t-1} + \lambda_5 open_{t-1} + \lambda_6 nfa_{t-1} + \lambda_7 tar_{t-1} + \lambda_8 oil_{t-1} + \mathcal{E}_t \quad 3.16$$

$$\Delta M_j = c + \sum_{i=1}^{p} \theta_i \Delta M_{t-i} + \sum_{i=1}^{p} \propto_i \Delta GDP_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta open_{t-i} + \sum_{i=1}^{p} \partial_i \Delta reer_{t-i} + \sum_{i=1}^{p} \sigma_i \Delta FX_{t-i} + \sum_{i=1}^{p} \delta_i \Delta Mis_{t-i} + \lambda_1 M_{t-1} + \lambda_2 open_{t-1} + \lambda_3 reer_{t-1} + \lambda_4 FX_{t-1} + \lambda_5 Mis_{t-1} + \lambda_1 GDP_{t-1} + \mathcal{E}_t \quad 3.17$$

$$\Delta X_j = c + \sum_{i=1}^{p} \theta_i \Delta X_{t-i} + \sum_{i=1}^{p} \propto_i \Delta GDP_{t-1}^{f} + \sum_{i=1}^{p} \gamma_i \Delta RP_{t-i} + \sum_{i=1}^{p} \partial_i \Delta reer_{t-i} + \sum_{i=1}^{p} \sigma_i \Delta Open_{t-i} + \sum_{i=1}^{p} \delta_i \Delta Mis_{t-i} + \lambda_1 X_{t-1} + \lambda_2 open_{t-1} + \lambda_3 reer_{t-1} + \lambda_4 FXRP_{t-1} + \lambda_5 Mis_{t-1} + \lambda_1 GDP_{t-1}^{f} + \mathcal{E}_t \quad 3.18$$

$$\Delta TB_j = c + \sum_{i=1}^{p} \propto_i \Delta TB_{t-i} + \sum_{i=1}^{p} \partial_i \Delta tot_{t-i} + \sum_{i=1}^{p} \sigma_i \Delta reer_{t-i} + \sum_{i=1}^{p} \delta_i \Delta GDP_{i-1}^{f} + \sum_{i=1}^{p} \gamma_i \Delta GDP_{t-i} + \sum_{i=1}^{p} \eta_i \Delta FX_{t-i} + \sum_{i=1}^{p} \theta_i \Delta INF_{t-i} + \sum_{i=1}^{p} \mu_i \Delta M3_{t-i} + \lambda_1 TB_{t-1} +$$

$$\lambda_2 tot_{t-1} + \lambda_3 reer_{t-1} + \lambda_4 GDP^f_{t-1} + \lambda_5 GDP_{t-1} + \lambda_6 FX_{t-1} + \lambda_7 INF_{t-1} + \lambda_8 M3_{t-1} + \varepsilon_t$$

3.19

The calculated *F*-statistic for the joint significance of the lagged variables was used to test for cointegration between the variables in models (3.16) to (3.19). The two sets of adjusted critical value bound as I(0) and I(1) as lower and upper bound respectively were adopted as prescribed by Pesaran Shin and Smith (2001). According to the bounds test, if the lower bound is above the computed *F*-statistic the then regardless of whether the variables are I(0), I(1), the null hypothesis of no cointegration cannot be rejected. In case upper bound is below the computed *F*-statistic, then the null hypothesis is rejected. The cointegration results are considered inconclusive if the computed *F*-statistics fall amid the two bounds.

3.7.3 Diagnostic and Stability Tests

To ensure consistent and unbiased regression results, various diagnostic tests include normality test using Jarque Bera statistics, serial correlation Breuch-Godfrey Lagrange Multiplier (LM) test, autoregressive conditional heteroskedasticity (ARCH) test, RESET test for model specification, and CUSUM test for parameter constancy were conducted.

CHAPTER FOUR

EMPIRICAL FINDINGS

4.1 Introduction

This chapter is divided into sections consisting of descriptive statistics, tests result of time series properties, and diagnostic tests on estimated models.

4.2 Descriptive Statistics

The summary statistics in terms of the mean, median, maximum, minimum and standard deviation of the variables used in the study are derived from table A14 and shown in Table 4.1.

Table 4.1: Descriptive Statistics

Variable	Mean	Minimum	Maximum
Foreign Reserves (FR) (KES Billion)	299.38	61.30	818.30
Gross Domestic Income (GDP)- Kenya (KES Billion)	705.16	242	1,929.30
Gross Domestic income –EU (GDP foreign) (Billion Euros)	3,101.08	2,368.10	3,740.20
Government expenditure (Gov) % of GDP	0.83	0.18	3.03
Net Foreign Assets (NFA) (KES Billion)	251.62	58.50	591.90
Crude Oil Prices (Oil) (USD/Barrel)	64.92	19.34	122.48
Imports from EU (M) (KES Billion)	22.83	10.27	40.11
Exports to EU (X) (KES Billion)	17.82	7.54	31.08
Money supply M2 (MS) (KES Billion)	969.80	305.10	2,360.20
Inflation (INF) (%)	8.15	1.22	19.19
Tax Revenue (TAR) (%) of GDP	0.43	0.14	1.06
Trade Balance (TB) (ratio -absolute)	0.80	0.45	1.21
Relative Prices of Imports (RPM) ratio of domestic import prices to world import prices	0.09	0.05	0.11
Relative Prices of Exports (RPX) ratio of domestic export prices to world export prices	0.03	0.02	0.04
Real Effective Exchange Rate (REER)	78.59	58.17	109.88
Trade Openness (Open) (X+M) (%) of GDP	15.73	9.07	30.01
Terms of Trade (ToT) ratio of export prices to import prices	0.43	0.30	0.64
Productivity (Prod) (%) gross capital investment to GDP	19.34	16.20	22.5

Source: Author's computations

Kenya's GDP ranged from KES 242 billion in 2000Q2 to KES 1,929.3 billion in 2016Q2 with a mean of KES 705.2 billion between 2000 and 2016. The data had a dramatic shift with GDP value more than doubling from KES 343.5 billion in 2008Q4 to KES 701.9 billion in 2009Q1. This was due to a change of the base year from 2001 to 2009 in the System of National Accounts (Republic of Kenya 2015). This change involved inclusion of new data that had become available since the previous major revision of national accounts. The low economic growth in 2008 was precipitated by the economic uncertainties resulting from the violence that was generated by the 2007 general elections. The uncertainty of 2008 was followed by a rebound in tourism, stable macroeconomic environment and strong remittance inflows. Another shock that is masked in the GDP descriptive is the prolonged decline from KES 1,363.3 billion in 2014 Q2 to KES 1,325.9 billion in 2014 Q4. During 2013/2014 fiscal year, there was a slowdown in the all-important agricultural sector which contributes 30 percent of the country's total output. The mean foreign national income was 3,101.081 billion euros with a minimum of 2368.1 and a maximum of 3740.2. the EU GDP grew persistently between 2000 and 2016 with a notable dip in 2008 attributed global financial crisis of 2007 - 2010.

Government expenditure has been on an upward trend averaging 83 percent of national income with a maximum of 303 percent in Q2 of 2013. The 2013/14 fiscal year was the first year of devolution and was marked with massive government transfers towards formation and setting up of devolved government authorities. While government expenditure remained fairly stable between 2000 and 2007, it has been on an accelerated trend since then. Another Government expenditure above 100 percent is seen in 2010 Q2

the year which closed the fiscal stimulus phase to counter the economic downturn from the negative global and domestic shocks which saw aggregate public spending increased significantly mainly in development. Despite devolving some functions to the county governments, the government expenditure remained at relatively high levels. Additionally, the spikes in 2010Q2, 2011Q2 and 2012Q2 can be explained by increased spending in security sector and implementation of flagship projects contained in the Jubilee manifesto (World Bank 2014). According to Njuru, Ombuki, Wawire, and Okeri (2014), due to the austerity measures initiated by International Monetary Fund (IMF) in early 2000s, and considering recurrent expenditure was fixed, the only leeway the government had was development expenditure. The increasing trend is therefore attributed to enhanced expenditure on infrastructure, health, education mostly after 2007. On a quarter to quarter basis, the data does not reflect the government disbursement pattern which is normally in September and therefore the lowest disbursement is in first quarter.

The mean tax revenue to GDP ratio is 43 percent with minimum tax ratio being 27 percent in 2001Q3 and maximum 106 percent in 2008Q2. Tax revenue is expected to grow with GDP and the ratio remaining fairly consistent. Theoretically, a growth in tax revenue GDP ratio indicates decreased private spending meaning the prices of domestic goods are reduced relative to foreign goods. According to the IMF and the World Bank, low income countries have a tax to GDP ratio of 10 – 20 percent as compared to the high income group that have a tax GDP ratio of 30-40 percent. The high value obtained could be attributed to source of data. Tax revenue in this study included import duty, excise duty, income tax, VAT and other incomes.

National foreign exchange reserves averaged KES 299.38 billion between 2000 and 2016 with a minimum of 61.3 billion and maximum of 818.3billion. A country's National foreign exchange reserves indicate the country's capacity to import and is calculated at the prevailing exchange rate were highest in 2016 Q2 at KES 818 billion and lowest in 2000 Q1 at KES 61 billion. According to the Central Bank of Kenya the foreign exchange reserves are used to: Service external obligations; and, smoothen erratic movements of the exchange rates. In terms of months-of-import cover the IMF sets the minimum at 4 months' worth equivalent foreign exchange reserves of import cover as basis for a country's continued participation in international trade transactions in the current year. This ensures the country has capacity to pay for its import trade commitments and this target has been threatened by accelerated imports, growing external debt obligation, and efforts by the Central Bank to save the Kenya shilling. This statistic masks the quarterly fluctuation due to changes in the exchange rate and therefore their level depends on the stability of the exchange rate.

Between 2000 and 2016, Kenya's imports from EU had a mean value of KES 22,834 million with the minimum import value of KES 10.271 million in 2000Q1 and a maximum of KES 40.11 in 2010Q4. Imports from EU remained fairly stable between 2000 and 2008, and accelerated from 2009 to 2016. During the same period, Kenya's Exports averaged KES 17.82 billion with a minimum of KES 7.54 billion in 2001Q3 and a maximum of KES 31.08 billion in 2016Q1.

Money supply averaged KES 969.8 billion ranging from KES 305.1 billion in 2001Q2 to KES 2,360.2 billion in 2016Q4. There is a theoretical long run relationship between money supply and gross domestic product. As such money supply increased significantly between 2000 and 2016. At the same time inflation ranged from a minimum of 1.22 percent to a maximum of 19.18 percent with an average of 8.1. Inflation was highest in 2008 due to increased food prices attributable to disruptions in agriculture and transport sectors due to the post-election violence that followed the 2007 elections. Another surge was witnessed in 2011 which according to (Republic of Kenya, 2012) was driven by food and oil prices. The food prices increase was attributed to weather-related supply side constraints and the rise in global commodity prices. The first half of 2011 was also characterised with inadequate rainfall hence the prices of a number of staple food items were pushed upwards. The oil price increase originated from supply side disruption due to politically driven unrest in some of the oil producing countries.

The net foreign assets averaged 251.6 and ranged from 58.5 in march 2000 to 591.9 in September 2016. The lowest brent oil price was reported in 2001 at 19.34 USD per Barrel while highest was 122.48 USD per Barrel in 2008. The low price in 2001 was attributed to US economic slowdown and the increased oil production by Russia which surpassed the OPEC supply. The Brent price for crude oil is considered the bench mark price for world oil. This oil shock can be traced to the sudden ascension in the oil price of between 2004 and 2008 which coincided with the first significant decrease in non-OPEC supply since 1973, and led to unprecedented swell of oil demand globally. Economic theory posits a

positive correlation between the real price of oil and the value of real exchange rate and therefore the Brent price mirrors Kenya's exchange rate.

During the study period, trade openness was lowest at 9.07 in 2016Q2 and highest at 30.01 in 2008Q3 with an average degree of 15.73. Trade openness measures the degree to which non-domestic transactions (imports and exports) take place and affect the size and growth of a national economy. Kenya does not have a policy that direct investment to defined geographic locations but generally encourages investments in sectors that create employment, generate foreign exchange, and create forward and backward linkages with rural areas with a view of investment retention. Although the Kenya Government does not restrict domestic investors from investing abroad it does not promote or incentivize investment abroad. At present, the bulk of outward investment is within the EAC, making the most of Kenyan preferential access between EAC member countries. This ideally means that beyond EAC region, there is little if any investment by Kenyan investors implying therefore, that with conducive environment domestically it becomes a key destination of foreign goods and hence trade deficit.

The Terms of trade measures as a ratio of export prices to import prices averaged 43 percent and ranged between 30 percent and 64 percent. This data does not however show that between 2000 and 2004 the terms of trade on an annual basis deteriorated by 2 percent (Republic of Kenya 2005), by 2.6 between 2005 and 2006 (Republic of Kenya 2007), 5.5 percent between 2006 and 2013 (Republic of Kenya 2014) and only improved by 0.2 percent by 2015 attributed to improved export unit prices together with a decline in import

prices of mineral fuels (Republic of Kenya 2016). Kenya's terms of trade declined by an average of 15 percent between 2005 and 2010, and 11 percent from 2005 to 2016.

Trade balance ranged from 0.45 to 1.21 with an average of 0.80 for the period 2000 and 2016. Kenya-EU trade balance has been in favour of EU mainly because Kenya exports raw agricultural commodities very little or no value addition and to a fixed menu of EU countries. The relative prices of imports averaged 0.078 with lowest price being 0.05 and highest price being 0.11. On the other hand, relative prices of exports had a mean of 0.03 ranging from 0.027 to 0.04. The implication of higher relative prices of imports is reflected in the terms of trade.

Productivity was used as proxy for technological change and was measured as the value of investment (gross capital formation) to GDP at market prices. Investment in new equipment, research and technology increases a country's international competitiveness. This is because of the productivity gained from efficient machines, advanced software and better research and technology. Relative to other countries a gain in a country's productivity improves it competitiveness internationally. Productivity was lowest in in the first quarter of 2003 at 16.2 percent and highest in fourth quarter of 2014 at 22.49 percent in the year Kenya's FDI reached a historical high of KES 89.9.00 Billion and was lowest in 2004/2005.

These descriptive statistics point to various gaps that require further analysis such as disaggregated government expenditure i.e. recurrent and development, the actual contribution of trade deficit in real effective exchange rate volatility, the effect of inflation on real effective exchange rate, and the actual position of foreign exchange reserves in the face of growing external debt and accelerated import. Section 4.3 outlines the diagnostic tests of the variables used.

4.3 Time Series Properties

Data stationarity or non-stationarity is primarily determined before running regression analysis to eliminate the danger of finding significant regression results from unrelated data if non stationary data series is utilized in regression analysis. Spurious results may be obtained by inclusion of non-stationary variables in regression models such that the *R*-square values and *t*-statistics, which do not follow the normal distributions and can be widely inflated. That is, if non stationary time series are used in a regression model, the results may show a significant relationship where none exists.

4.3.1 Unit Root Tests

Due to the use of time series data in this study, there was need therefore to establish the stationarity or non-stationarity of the data. ADF and PP tests are associated with low power against stationary near unit root processes and therefore, Kwiatkowski Phillips, Schmidt and Shin (KPSS) was more appropriate and the test results are annexed in Table A13.

The results show that Foreign exchange reserves, local national income, foreign national income, money supply, real effective exchange rate, terms of trade, net foreign assets, productivity, relative price of imports, tax revenue, world oil prices, trade openness, exports, and imports were stationary at first difference I(1) while inflation, government expenditure, trade balance, exchange rate misalignment, exchange rate volatility and relative price of exports were I(0) meaning they were stationary at level. Since none of the variables was integrated of order two I(2) the ARDL technique was most appropriate since it does not require the same order of integration and none of the variables should be integrated of order I(2).

4.3.2 Cointegration Analysis

Cointegration according to Engel and Granger (1987), implies that although time series can be nonstationary individually, stationarity can occur if a two or more series are linearly combined. Meaning, among non-stationary time series, there exists a long run relationship. Cointegration tests effectively try to determine the stationarity of the residuals such that two variables are said to be cointegrated if the residuals are stationary, and are not cointegrated if the residuals are nonstationary, and any regression relationship between the two variables is said to be spurious. Since the variables were integrated of order I(0) and I(I), ARDL bounds test was considered the most appropriate method to test for cointegration. The bounds test results for all the models used are summarized in Table A12. Following Pesaran *et al*., (2001), the computed *F*-statistics were matched with the bounds critical values at the optimal lags (k). Co-integration was established in all the objectives since the *F*-statistics was above the upper bound.

4.4 Diagnostic and Stability Tests

Various diagnostic and stability tests were carried out on the estimated models and the results are presented in sections 4.4.1 and 4.4.2.

4.4.1 Normality, Serial Correlation, and Heteroskedasticity Tests

in many statistical tests the prerequisite test is a normality test because data normality is a fundamental assumption in parametric testing. In finite samples, observations non-normality leads to a general invalidity of the the associated *t* and *F* statistics (Das and Imon, 2016). To test for normality, the Jarque-Bera test was applied. The Jarque-Bera test is premised on the null hypothesis H_0: JB=0 for normality and H_A: JB≠ 0 for non normality. From the normality test histograms the results are sumarised and annexed in tables A2, A7, A9, and A11 where the Jarque-Bera statistics *P*-values are greater than 0.05 implying that at 5 percent level of significance, the null hypothesis that the residuals are normally distributed could not be rejected hence the series is normally distributed. This results follows that since the *t* and *F* statistics have a normal distribution, they could be utilized for hypothesis testing.

Mostly due to omission of relevant variables or correlation across periods of those variables that are included, serial correlation is normally an inherent problem in time-series data. Despite achieving unbiased and linear estimates, there is loss of the minimum variance property, unreliability of the the *t* and *F*-statistics which may lead to potentially incorrect conclusions from hypothesis tests. The Breusch-Godfrey serial correlation LM test was applied to test for serial correlation in the ARDL estimates. To check for the absence of

ARCH effects residuals the Auto Regressive Conditional Heteroskedasticity (ARCH) test was utilized. The null hypothesis of no serial correlation could not be rejected at 5 percent significance level since the probability values of the computed test statistic (*P*-values) presented in tables A2, A7, A9, and A11, were greater than 0.05.

4.4.2 Model Specification and Parameter Stability Tests

In order to avoid specification errors such as omission of relevant variable, inclusion of unnecessary variable, adoption of the wrong functional form, errors of measurement and incorrect specification of the error term, a model specification test was carried out. This is to ensure that the functional form of the model used was linear. The general test for the specification errors highlighted is the regression specification error test (RESET). The results of the Ramsey RESET are summarized and annexed as TableA3 and had probability values greater than 0.05 meaning the null hypothesis could not be rejected.

To test for structural stability, a cumulative sum (CUSUM) test was applied to check for any systematic movements where a possible structural instability is reflected by the values of the coefficients. This test is founded on plotting the sum of the recursive residuals against a critical bound such that if the sum goes beyond the critical bound, there is a structural break at the point at which the sum began its movement toward the bound. The cumulated sum of the residuals forms the basis of the CUSUM test such that:

$$W_t = \sum_{j=K+1}^{T} \frac{W_t}{\hat{\sigma}} \qquad 4.1$$

where *k* is the minimum sample size. According to Farhani, (2012), the CUSUM test is performed by plotting the cumulative sum *W*t against *t*. The null hypothesis of the test

imply that the mean of the cumulative sum is zero, E(Wt) = 0 such that any deviations from zero is assessed against two 5 percent significance lines whose distance increases with *t*. A structural instability is indicated by the cumulative sum crossing the critical lines. The CUSUM test results summarized in Figures A3 through to A10 show the divergence of the plots is not significantly far from the zero line and the residuals are within the standard error band.

4.5 Exports, Imports and Trade Balance Response to Exchange Rate

4.5.1 Determining the Extent of Kenya's Real Exchange Rate Misalignment

The intention of the first objective was to determine the extent of exchange rate misalignment in Kenya. First the determinants of the real exchange rate were established using the autoregressive distributed lag (ARDL) modeling techniques given its usefulness when variables are integrated of order zero and order one. Model 3.17 was estimated and general ARDL results are presented in Table A1, while the long run coefficients of the determinants of exchange rate are presented in Table 4.2. The short run effects are appended as Table A4.

Table 4.2: Long-Run effects of Economic Fundamentals on Real Effective Exchange Rate

Dependent Variable – log of Real Effective Exchange Rate				
Explanatory Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**P-Value**
Government expenditure	0.071	0.05	1.42	0.20
Log of Net Foreign Assets	0.415**	0.17	2.44	0.02
Log of Productivity	0.354***	0.13	2.72	0.00
Tax Revenue	-0.119	0.09	-1.32	0.23
Oil Prices	-0.001***	0.00	-1.73	0.00
Openness	0.015**	0.01	1.50	0.04
Terms of Trade	0.004**	0.00	2.44	0.02

***, **, and *, denote significance at 1%, 5% and 10% levels respectively.
Source: Author's computations.

The results show that the real effective exchange rate is determined by the macroeconomic fundamentals considered except government expenditure and tax revenue. The coefficients on government expenditure and tax revenue were found to be positive and negative respectfully, but statistically insignificant at any level.

The coefficient of 0.41 for the log of net foreign assets (NFA) is positive and statistically significant at five percent level. This means that a one percent increase in the net foreign assets depreciates the real effective exchange rate by 0.41 percent. according to economic theory, the exchange rate has a positive relationship with shocks on the net foreign asset position. Indeed, similar results were found by Kubota, (2009). This effect is as a result of the transfer effect where the transfer of external wealth into the domestic economy has a strong positive relationship with the exchange rate in the long run.

The coefficient of the log of productivity of 0.35 was positive and statistically significant at one percent level as shown by the P value of 0.001. This result implies that, a one percent productivity improvement leads to a 0.35 percent depreciation of the real effective exchange rate. In theory, increased productivity leads to a real exchange rate appreciation. However, according to Balassa, (1964) and Samuelson, (1964) the effect depends on whether the productivity is in the traded or non-traded sector. A positive change in productivity measured by technological progress leads to an income effect. Therefore, an increase in demand for non-tradable goods, which leads to an increase in the price of non-tradables and hence a real exchange rate appreciation. An appreciation according to the authors can also result due to faster rate of technological progress. Nevertheless,

productivity can also bring a real exchange rate depreciation if the resultant offer effect is greater than the income effect. According to Edwards, (1989) an increase in technical progress in developing countries depreciated the real exchange rate. This could be because their main traded sector is the agricultural sector and the rate of technological progress is slow. Kenya like many developing countries traded sector is actually the agricultural sector and therefore explains the depreciation.

The coefficient of world oil prices of -0.001 is negative and statistically significant at one percent level as indicated by the P-value of 0.00. This implies that a unit percent increase in the prices of world brent oil leads to a 0.1 percent appreciation of the real effective exchange rate. Kenya is a net importer of oil and the bulk of imports is comprised of oil and the country's non-tradable sector is bigger than the tradable sector. Any upward movement in oil prices puts increasing pressure on local prices to go up hence appreciating the exchange rate. Although other empirical studies show ambiguous results, there is a general consensus that oil prices significantly affect the exchange rate with the effect increasing if the country is a net importer of oil. A study by Ngoma, Ismail, and Yusop, (2016), shows that increases in real oil prices led to exchange rate appreciation in Nigeria, South Africa and Tunisia and real depreciations in Egypt and Ghana.

The coefficient of 0.015 for trade openness is positive statistically significant at the 5 percent level. This means that a 1.5 percent depreciation of the real effective exchange rate results from a one percent increase in trade openness. Increase in openness favours the stronger economy in this case EU and hence more imports than exports. The increased

imports lower the price of tradeable goods in the domestic economy. According to purchasing power parity theory tradeable goods become cheaper to foreigners hence the local currency depreciates. The results show that openness is a constraint on policymakers' incentives to stabilize the domestic currency in real terms. Similar results by Nkalu, Urama, and Asogwa (2016) in Nigeria indicate that trade openness was a significant variable and contributed upto 59 percent on the depreciation of the Naira. Other studies that found similar results include Zakaria and Ghauri, (2011), who argue that trade liberalization in small closed countries, demand for importables increases while demand for nontradables decline due to the relative price change. As long as the Marshall-Lerner condition holds, a real depreciation is necessary to maintain internal and external balances.

with regard to the terms of trade, the coefficient of 0.004 is positive and statistically significant at 5 percent level. The results mean that, a one percent increase in terms of trade leads to a 0.4 percent depreciation of the real effective exchange rate. According to Imed and Christophe, (2003), the effect of terms of trade on the real exchange rate is theoretically ambiguous and depends on the relative magnitude of the substitution effect and income effect. The results exhibit an indirect substitution effect which induces a variation of the demand of the non-tradable goods where a terms of trade improvement provides currency resources necessary to produce more non-tradable goods. Considering developing countries such as Kenya are intermediate goods import dependent, an increase of available resources permits to produce more leading to lower price of non-tradable goods hence a real exchange rate depreciation.

The long run estimates of the economic fundamentals were then used to obtain the fitted values of the equilibrium real exchange rates (ERER). The exchange rate misalignment (Mis) was hence computed following Mwega, (2014) as: $Mis = \left(\frac{ERER-REER}{REER}\right) * 100$ and are appended as Table A5. The ERER is the estimated equilibrium exchange rate proxied by the fitted values. Figure 4.1 plots the misalignment values in percentages given in Table A5.

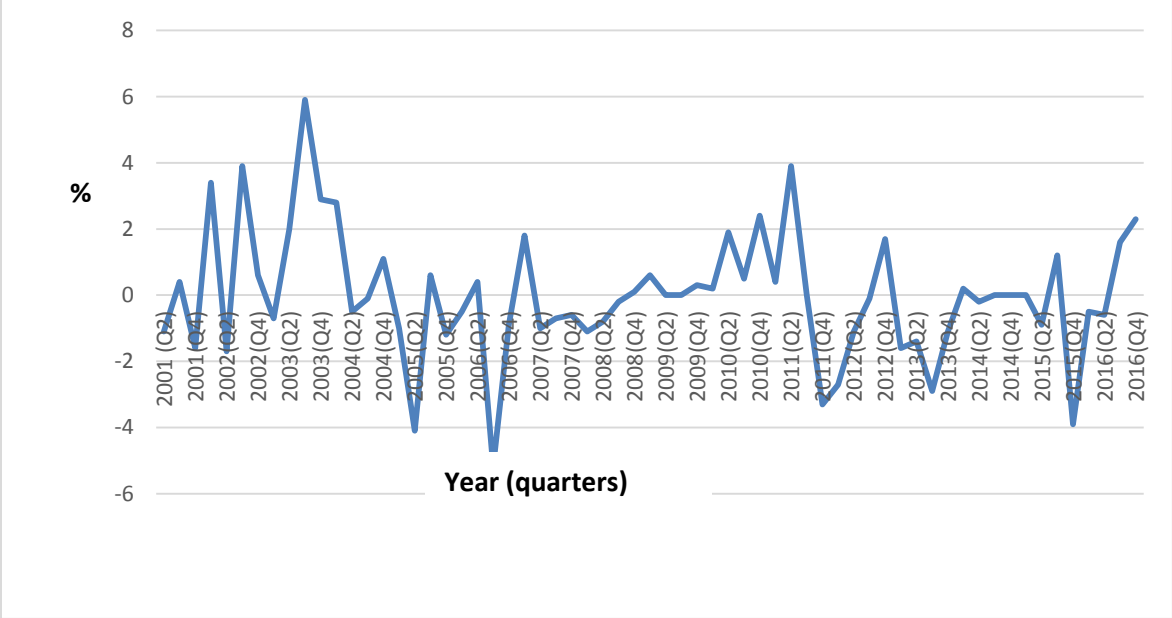

Figure 4.1: Real Exchange Rate Misalignment
Source: Author's computations

Figure 2 shows that the real effective exchange rate appreciated and depreciated in different periods. The period between 2001 and 2004 and 2009 to 2011 show notable overvaluation of the exchange rate. The change in government in 2003 could be attributed to the low misalignment between 2004 and 2008, and the prolonged appreciation of the exchange rate during this period. Exchange rate misalignment in the period considered was 5.9 percent overvaluation when the exchange rate reached 99.6 in 2003Q3 and the maximum

undervaluation was 5.2 percent when the exchange rate reached 80.3 in 2006Q3. From Figure 4.1 the real exchange rate is in general misaligned but within 6 percent range the results are similar to Kiptui and Ndirangu (2015), who found that Kenya's exchange rate exchange rate misalignment was within 10 percent of its equilibrium level between 2000 a d 2014, exhibited both periods of overvaluation and undervaluation, and was consistently in line with the economic fundamentals. Further, the results show spikes and dips that can be traced to volatility during this period which moved with periods of appreciation and depreciation.

In comparison with the entire period, the period between 2000 and mid 2003 exhibit high spikes which correspond to mild appreciation of the KES. The crossing over into a new millennium in 2000 saw the depreciation of many currencies worldwide. For the Kenya Shilling however, the cross over to the new millennium saw a steady though relatively low appreciation of the currency. The significant spike between 2003Q2 and Q4 can be attributed to the political risky event of the 2003 elections. According to Ochieng, (2013), an increase in political risk depreciates the currency of the country that is experiencing the political risk. Exchange rates reacts just before the politically risky event or in the middle of the risky event because the foreign exchange market reacts to expected changes in the business environment. Typical of floating exchange rate regimes, agents react to a political risk by selling currency of the risky country and buying currency of countries that are considered stable. This can explain the noticeable spikes in 2003, 2005 (constitutional referendum) 2007 and 2010 (inauguration of the Constitution).

Results show that between 2005 and 2007/8 there was noticeable exchange rate appreciation and there are erratic spikes clustered in 2007 particularly associated with political risk. A noticeable incident in that period in Kenya was the 2007 elections, and the subsequent post-election violence. The appreciation from 2004 died down considerably with the onset of election year in 2007. According to (CBK, 2008), the Central Bank attributed the onset of the exchange rate depreciation to the increased demand for the dollar triggered by announcement of plans to import maize.

The period 2009-2014 signified the historical exchange rate depreciation. Contrary to previous spikes where they occurred in a period of appreciation, the notable spikes in this period occurred during a depreciation. According to Omolo (2014), in a span of 148 days covering June to October, 2011, the exchange rate moved from 86 to 105 and back to 100 KES/USD, hence explaining the high fluctuation. There is also a large spike at the end of 2011 associated with a temporary currency appreciation from an all-time high of 105 when the shilling crashed. The Central Bank attributed the exchange rate appreciation to the contractionary Monetary Policy implemented from November to June 2012 to reduce inflationary expectations and exchange rate volatility. (CBK, 2012).

4.5.2 The Effect of Exchange Rate Misalignment on Bilateral Trade Flows between Kenya and EU

To determine the effect of exchange rate misalignment on imports and exports, equations 3.18 and 3.19 were estimated and the general results are presented in table A6 and A8. The estimated *R* squared were 87 percent and 85 percent for imports and exports respectively,

while the adjusted *R* squared was 84 percent for imports and 82 percent for exports. The estimated *F* statistics had a probability value of 0.000 implying joint significance of all independent variables used in the models. The long run coefficients and standard errors are given in Table 4.3 and indicate how imports and exports reacted to changes in their explanatory variables in the long-run. The long run coefficients for an Xi an independent variable were derived from the general ARDL estimates presented tables A6 and A8. This is achieved by using the ratio of sum of coefficients of independent variables Xi from zero lag to maximum lag to the value of the polynomial associated to the dependent variables.

Table 4.3 Long-run Effects of Exchange Rate Misalignment on trade flows

Explanatory variables	**Dependent Variable**							
	Log of Imports				**Log of exports**			
	Coefficient	**SE**	***t*-stat**	**Prob.**	**Coefficient**	**SE**	***t*-stat**	**Prob.**
Log of Real GDP	0.489**	0.164	2.981	0.009				
Log of real GDP foreign					10.058***	4.203	2.393	0.000
Relative Prices	-0.499***	3.137	-0.159	0.000				
Log of Relative Prices					0.915***	0.160	5.718	0.000
Foreign Reserves	0.023	0.005	4.543	0.191				
Misalignment	-0.131**	0.060	-2.183	0.004	0.035	0.004	8.750	0.161
Log of trade Openness	0.305	0.241	1.265	0.207	0.378***	0.342	1.105	0.006
Real Effective Exchange Rate	-0.029***	0.018	-1.611	0.000				
Log of Real Effective Exchange Rate					1.054	0.660	1.596	0.203

[***], and [**], denote significant levels at 1%, and 5% respectively.
Source: Author's computations

The coefficient for local national income (GDP) of 0.489 for imports is positive and statistically significant at 5 percent as indicated by the p-value of 0.009. This implies that a one percent increase in local GDP increases imports by 0.49 percent. According to economic theory a country's imports depend on its level of income such that the higher the level of income, while holding the prices of imported goods and tastes of consumers constant, the greater the imports will be. Gaalya, Edward and Eria (2017), found that imports in the East Africa Community (EAC) member states are income inelastic with income elasticities concentrated between 0.4 and 0.07. The results also are in line with the authors who argue that income elasticity is higher (but less than unity), than the price elasticity. Further, GDP per capita has a higher influence on consumer goods than capital and intermediate goods and therefore can be used to explain the low income elasticity obtained.

The coefficient for foreign GDP of 10.058 is positive and statistically significant at 1 percent level as indicated by the p-value of 0.000. This implies that a 1 percent increase in foreign income increases exports by 10 percent. According to economic theory a country's imports depend on its level of income such that the higher the level of income, while holding the prices of imported goods and tastes of consumers constant, the greater the imports will be. According to Gaalya *et al.*, (2017), GDP per capita has a higher influence on consumer goods than capital and intermediate goods. Kenya's exports to EU are mainly consumer (food products) goods which could explain the high elasticity of income.

The coefficient of -0.499 for relative prices of imports is negative and significant at 1 percent as indicated by the p-value of 0.000. This implies that a unit increase in relative prices of imports reduces imports from EU by 49 percent. Considering Kenya's imports from EU include motor vehicles and accessories, human medicine and agricultural chemicals, steel and iron products, rubber, computers and accessories, veterinary products, fuels and lubricants, electrical and electronic equipment, China has offered an alternative avenue to source for these goods. It is therefore likely that an increase in import prices causes Kenya to shift imports from EU to alternative markets such as China. In 2000 imports from china amounted to a paltry KES 7.76 billion while imports from EU amounted to KES 75.65 billion. In 2016, imports from china amounted to KES 337.45 billion while imports from EU amounted to KES 212.57 billion (Republic of Kenya 2004, and 2019). Taking machinery for instance, the import price index increased from 227.4 in 2014 to 292.3 in 2016. Although unusually large, Reinhart, (1995) asserts that unlike in developed countries, large price elasticities imply that slight changes in relative prices produce large movements in trade flows. Ekanayake, Thaver and Plante (2012), found a negative impact of relative prices of imports on South African imports from EU. This shows that Kenya's imports are relative price elastic because a small change in price leads to a more than proportionate reduction in demand. This is consistent with economic theory and the expectation that an increase in the relative price of imports leads to reduced imports.

Regarding relative prices of exports, the coefficient of 0.915 is positive and statistically significant at 1 percent level as indicated by the p-value of 0.000. A one percent increase in relative prices of the exports raises Kenya's exports to EU by 0.9 percent. Imbs and

Isabelle (2011), argue that, the response of exports due to relative price changes depends on the willingness of the consumer to substitute domestic and foreign goods. In case of good in substitutability, an increase in price does not adversely affect exports. These results indicate that Kenya's exports to EU are non-substitutable while flowers produced in Israel which is Kenya's competitor are produced at very high costs. According to Barno, Ondaje and Ngwiri (2011), Kenya is among the world producers of specialty vegetables. In addition, globalization has seen changes in consumer food demand where consumers are considering all year round food supplies, produced by extensive agricultural techniques with a strong ethical component. This has led to consumers considering quality over price. The results therefore, reflect the reality where Kenya's green beans are among the world's best while snow peas have replaced Asian vegetables in the world market.

With regard to the foreign reserves, the long run coefficient is positive and statistically insignificant. A similar result came from the study by Mohsen, Chua, and Sab, (2016) who found out that foreign exchange reserves did not have a significant effect on consumer goods, raw materials and capital goods in Zambia.

The real exchange rate misalignment coefficient of -0.131 for imports is negative and statistically significant at five percent level as indicated by the p-value of 0.004. A one percent increase in misalignment reduced imports by 13 percent. Similar results were obtained by Olimov and Sirrajidinov, (2008) who found that exchange rate misalignment had depressing effect on imports and exports in Uzbekistan. Misalignment inhibits imports such that higher volatility (hence higher misalignment) of exchange rate deters the volume

of trade when expected profits are uncertain. The results therefore show that Kenyan importers are risk-averse and being a developing country, with no structured market for foreign exchange, the avenue for hedging is either expensive, impossible or both. The real exchange rate misalignment coefficient of 0.035 for exports is positive and statistically insignificant. This is consistent with majority of other studies such as Ibrahim, (2014) who found that misalignment is an insignificant determinant of exports while it is significant in imports. Sidek, (2011) indicated that any misalignment has no statistical significance on exports if it is below 8.88 percent. The insignificance of the export coefficient can be explained by lack of diversification in Kenya's goods for exports. According to Juthathip, (2009), export diversification increases the significance and magnitude of the misalignment coefficient.

Trade openness was found to have a positive but insignificant coefficient for imports. According to Manni, (2012), although greater trade openness is expected to enhance a country's imports and exports it does not imply both must increase. Mohsen, Chua, and Sab, (2016) found no long run relationship between trade openness and imports in Syria. However, for Kenya's exports to the EU, the trade openness coefficient is positive and statistically significant at one percent level as indicated by the p-value of 0.006. This implies that a one percent increase in trade openness increases exports by 0.378 percent. The small size of the coefficient could be explained by the limited number of countries that Kenya trades with in the EU and also lack of diversification of her goods of trade. These results are in line with Santos-Paulino, (2003) who found that the Dominican Republic exports and imports increased with increased liberalization with the magnitude somewhat

the same for imports and exports. Zakaria, (2014) in another study, established that trade openness in the form of liberalization stimulates exports.

The real effective exchange rate coefficient of -0.029 for imports is negative and statistically significant at one percent level. This indicates that one unit of depreciation decreases imports by 2.9 percent. This was expected because theoretically depreciation of the domestic exchange rate against a foreign currency makes imports expensive and exports competitive. Similar results were obtained by Kemal and Qadir, (2005) in Pakistan where real effective exchange rate had a significant negative coefficient for imports. The coefficient for the log of real effective exchange rate for exports is positive and statistically insignificant. The positive relationship implies that depreciation of the real exchange rate lowers the price of exports hence the demand for exports increase in the world. The results are in line with Kemal and Qadir, (2005) whose results showed that Pakistan exports were not affected by real effective exchange rate and hence concluded that exchange rate should not be a concern for a country's exports.

4.6 The Effect of Exchange Rate on Trade Balance

To determine the effect of real exchange rate on trade balance between Kenya and EU equation 3.19 was estimated using ARDL approach. The long run coefficients and their corresponding standard errors are given in Table 4.4. The long run coefficients for an independent variable Xi were derived from the general ARDL estimates table A10. This is achieved by using the ratio of sum of coefficients of independent variables Xi from zero lag to maximum lag to the value of the polynomial associated to the dependent variables.

Table 4.4: Long-Run Effects of Exchange Rate on Trade Balance

	Dependent Variable: log of Trade Balance			
Explanatory Variable	**Coefficient**	**SE**	**t-Statistic**	**Prob.**
Log of Foreign Reserves	-0.606**	0.206	-2.941	0.016
Log of Gross Domestic Product	-1.371***	0.392	-3.497	0.006
Log of Gross domestic Product (foreign)	9.504***	1.956	4.858	0.000
Log of Inflation	-0.087	0.081	-1.074	0.309
Log of Money supply	-0.606**	0.237	-2.556	0.031
Log of Real Effective Exchange Rate	5.501***	1.334	4.123	0.002
Log of Terms of trade	-1.226**	0.459	-2.671	0.024

[***], and [**] denote significant levels at 1%, 5% and 10% respectively.
Source: Author's computations

The log of foreign exchange reserves coefficient on trade balance of -0.6067 is negative and statistically significant at 5 percent level as indicated by the p-value of 0.016. A one percent increase in foreign exchange reserves depresses trade balance by 0.6 percent. Sultan, (2011) asserts that foreign exchange reserves are an important determinant of a developing country's imports and have a negative influence, resulting to a deterioration in trade balance. This result was expected because trade balance is measured as the ratio of exports and imports. Foreign exchange reserves increase imports and therefore reduces the export import ratio.

The coefficient of 5.501 for the log of real effective exchange rate variable, is positive and statistically significant at a one percent level as indicated by the p-value of 0.002. A one percent depreciation of the real effective exchange rate would improve trade balance by 5.5 percentage. These results collaborate Lencho, (2013), Ogutu, (2014), and Trinh, (2014) who found that real effective exchange rate had a positive effect on trade balance. Theoretically a depreciation of the real effective exchange rate (an increase in real effective exchange rate) improves trade balance. Trinh (2014) further argues that the size of the

elasticity is important such that the high elasticity of the REER suggests a high trade deficit response to exchange rate fluctuation.

Concerning the log of inflation, the coefficient is negative and statistically insignificant consistent with Sharif and Ali, (2016) who found similar results concerning the inflation and trade balance in Somalia.

The coefficient of -1.371 for the log of domestic income (GDP) is negative and statistically significant at 5 percent level as indicated by the p-value of 0.006. A one percent increase in domestic income decimates the trade balance by 1.37 percent. Ling, Mun and Mei, (2008) argued that a positive coefficient of the domestic income means that the increase in domestic income is due to an increase in the production of import-substituted goods and when it is negative it implies increased expenditure on imported goods. Economic theory suggests that the import volume increases in a domestic country as the real income and purchasing power in the domestic economy rises. Higher domestic income therefore leads to increased imports, hence deteriorate the trade balance.

From the results, the log of foreign income on trade balance of 9.5046 has the expected positive significant coefficient at 1 percent level as indicated by the p-value of 0.000. This implies that a unit percent increase in foreign income improves Kenya's trade balance by 9.5 percent. The seemingly large coefficient is not unique to Kenya because according to Unnevehr, (2000), fresh food products have a high income elasticity of demand in high income markets. Kenya exports majorly fruits vegetables and cut flowers to EU which have

high income elasticity of demand and according to Unnevehr, (2000), such goods have not been protected by traditional agricultural trade barriers.

The results obtained show that, the log of money supply has a negative coefficient of -0.606 which is statistically significant at 5 percent level as indicated by the p-value of 0.031. A one percent increase in money supply depresses trade balance by 0.6 percent. The results are in line with theory and similar results obtained by Kipkosgei, (2011) on the determinants of the trade balance in Kenya. According to both Keynesian and monetarist schools of thought, the expected impact of money supply is negative. Although their rationale is different, the schools of thought agree in principle that the sign on domestic money supply should be negative. Monetarist argue that, increases in the money supply propel real balances above levels considered optional by economic agents, resulting in increased expenditure out of a given income which stimulate imports and causing the trade balance to deteriorate. Keynesians economist argue that an increase in money supply reduces interest rates hence increasing absorption, and therefore exerting the trade balance negatively.

The log of terms of trade coefficient of -1.226 is negative and statistically significant at 5 percent level as indicated by the p-value of 0.024. A one percent improvement in terms of trade deteriorates trade balance by 1.2 percent. These results therefore concur with Zakaria, (2014) and Ogutu, (2014) who found that an improvement of terms of trade deteriorated the trade balance. An improvement in the terms of trade means that export prices are increasing faster than import price. Therefore, holding all other factors constant, a rise in

export prices will cause a fall in the exports quantity. Relatively cheaper import prices will increase the quantity of imports and therefore lead to reduced trade balance.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

This chapter provides the summary, conclusion and policy implications of the study.

5.2 Summary

An exchange rate of a country is the rate at which its currency exchanges for a foreign currency. This rate varies frequently at the foreign exchange markets where various global currencies are traded. The exchange rate is an important variable in the economic processes from both the descriptive and policy perspectives and has emerged as a significant tool in the arsenal of economic management policies mainly due to its administrative simplicity. A country's exchange rates affect both the real economic variables as well as monetary variables. Studying the interconnectedness of a country's exchange rate and its competitiveness therefore, is key among a wide range of economic policy goals since its level and stability in relation to a long run level, impact the growth and volume of trade.

In order to assess how Kenya's exchange rate effects the bilateral trade between herself and European Union, the study addressed three specific objectives: to establish the extent of Kenya's exchange rate misalignment; to determine the effects of exchange rate misalignment on bilateral trade flows between Kenya and EU; and to determine the effect of exchange rate on trade balance between Kenya and EU.

The study was different from previous exchange rate-trade studies in Kenya in that, it sought to analyse the relationship of exchange rate and trade between countries which are in a trade agreement based on non-reciprocity in order to influence future trade agreement framework. From literature, the floating exchange rate regime has exhibited more pronounced exchange rate variability than the fixed exchange rate regime. Exchange rate variability represents a risk to international traders depending on whether they are risk averse or risk takers. In addition, various studies that have been carried out have had ambiguous results due to: models adopted, and the study sample. The study was motivated by the fact that the exchange rate variability may have led to the worsening of the trade position between Kenya and EU. The acceleration of imports over exports in an unreciprocated trade arrangement may have precipitated the trade remaining in favor of EU. Kenya's trade structure is biased in favour of the EU such that the bulk of her imports are used for manufacturing exportable and therefore studying variables that affect imports and exports is important.

To determine the equilibrium exchange rate, the monetary theory with sticky prices was adopted using the rational expectations hypothesis with no bubble solution. The elasticities approach was used in the traditional import demand equation to derive the import, export and trade balance relationships. The study employed an ARDL modeling due to its ability to combine both partial and adaptive expectation inherent in trade and exchange rate. Data concerning the other variables was acquired from secondary sources, such as, World Bank and EUROStat websites, Kenya National Bureau of Statistics publications and Central

Bank of Kenya monthly economic reviews. The study period covered the period from 2000 to 2016.

In determining the equilibrium exchange rate, an ARDL model was estimated using least squares, method and the associated elasticities were calculated. The determinants that had a positive influence on the real effective exchange rate were: net foreign investments, productivity, trade openness and terms of trade. On the other hand, international Brent crude oil prices negatively influenced the real effective exchange rate. The real effective exchange rate was overvalued up to 5.9 percent, and undervalued up to 5.2 percent, at different periods indicating misalignment. The exchange misalignment also followed the volatility with high spikes on periods preceding a political risk such as an election or referendum, and just before an appreciation or depreciation episode.

The ARDL model was also estimated to determine the effects of exchange rate misalignment on bilateral trade flows between Kenya and EU. Among other variables, the exchange rate misalignment was found to be a key determinant for imports with a negative influence. Concerning exports, the real exchange rate misalignment had a positive influence although not an important determinant of exports. Domestic income positively affected imports from EU, while relative prices and real effective exchange rate had a negative effect on imports. Foreign reserves was found to have an insignificant effect on imports. On the other hand, real foreign income, relative prices and trade openness had a positive effect on Kenya's exports to EU, while the real effective exchange rate does not influence exports.

Finally, the ARDL model was estimated to establish the effect of real effective exchange rate on trade balance between Kenya and EU. The effective exchange rate was found to positively influence the trade balance confirming the hypothesis that real depreciation succeeds in improving long run trade balance. Foreign Reserves, and money supply, negatively affected the trade balance, while inflation was found to be statistically insignificant.

5.3 Conclusions

One of the objectives of this study was to determine the extent of *RER* misalignment between the observed and equilibrium *RER*. Generally, the estimated long run parameters of the real exchange rate were found to be in line with the theoretical predictions. The considered macroeconomic fundamentals except government expenditure and tax revenue were significant determinants of the real effective exchange rate. The results show that during the period of study 2000Q1 to 2016Q4, the actual *RER* rate had more episodes of undervaluation than overvaluation. Misalignment was detected and was within 6 percent deviation from the long run equilibrium level. Further, the study found that the exchange rate exhibited a volatile trend. The study therefore concludes that Kenya's exchange rate is closely aligned to its long run macroeconomic fundamentals and that the adoption of the floating exchange rate regime has achieved one of the intended purpose namely reduction of exchange rate misalignment associated with overvaluation under the fixed exchange rate. Misalignment shown by spikes and dips follows exchange rate volatility and moved with periods of appreciation and depreciation.

This study empirically examined the effect of exchange rate misalignment among other economic variables on imports and exports between Kenya and EU. From the results, it can be concluded that exchange rate misalignment inhibits Kenya's imports from EU while it had no effect on exports. This result confirms that Kenyan exports are not diversified and this reduces the significance and magnitude of the effect on exports. It can also be concluded that Kenyan importers are risk averse and reduce their activities with increased exchange rate misalignment. This is in line with literature that suggest that in small economies, hedging instruments are not available and where they are available they are too costly or too complex to apply in small firms.

In line with economic theory, domestic income enhanced imports and the income elasticity is in line with the East Africa Community (EAC) member states whose income elasticities are concentrated between 0.4 and 0.07. Further, the results show a high foreign income elasticity and therefore it can be concluded that Kenya's imports are capital and intermediate goods which exhibit low income elasticity while the exports are consumer goods, which exhibit the higher elasticity.

The investigation on real exchange rate effect on trade balance show that a depreciation improves trade (reduction in imports) in line with theory. The results show that the real effective exchange rate has a positive long run impact on trade balance, implying that currency depreciation can lead to an improvement in trade balance. Conversely, currency appreciation can lead to a deterioration of trade balance. Considering the KES has significantly depreciated against the currencies of its main trading partners and particularly

the USD in real terms from 2008, movements in the exchange rate are in fact one cause of Kenya's trade deficit. The high elasticity coefficient of 5.5 shows that the impact of actual currency depreciation is significantly large.

Similar to other studies in developing countries, Kenya's exports respond well to changes in trading partner's incomes. Particularly, fresh food products have a high income elasticity of demand in higher income markets such as the EU. This therefore represent an important opportunity for Kenyan exporters since fresh fruits and vegetable exports account for the bulk of all food and agricultural exports to EU.

The results show that Kenya's exports respond positively to increase in relative prices of exports which according to literature shows in substitutability of imported goods to locally produced goods in EU. It can be concluded therefore that Kenya's exports are specialties in EU especially french beans, snow peas and cut flowers.

The results show that although trade openness improves both imports and exports, the magnitude is somewhat equal. The trade openness associated with the nonreciprocal trade arrangement between Kenya and EU under the ACP framework favors EU. This is typical of developing countries such as Kenya because they have a limited number of export goods and they are of raw materials nature. It can therefore be concluded that the EU-ACP non reciprocal agreement failed to consider the trade patterns between the partners and hence Kenya has not gained significantly from this agreement.

5.4 Policy Implications

It is evident from the study findings that Kenya's exchange rate is driven by the considered macroeconomic fundamentals. Thus, measures should be put in place to monitor changes in these fundamentals to ensure that the exchange rate does not deviate significantly from its equilibrium level. These measures include tempering the high dependency on oil imports. This can be achieved by expanding the refining capacity of oil discovered in the country as well as accelerating and expanding alternative sources of energy such as wind, geothermal and solar. Particularly, the Central Bank of Kenya should ensure that the shilling does not appreciate above its equilibrium level which can lead to loss of competitiveness.

Following the negative effect of real exchange rate misalignment on imports, and considering Kenya is import dependent in in many inputs used in production of exportables, there is need for the government to provide hedging instruments and where they are available and expensive make them affordable. This can be achieved by adopting policies that promote Nairobi as a regional foreign exchange market centre like Johannesburg in South Africa. This will promote trade diversification of Kenya's import sources or export agencies in EU, especially if the alternative sources can offer the same product. This measure can work well and to the advantage of the importers in case of a depreciation of the exchange rate. In addition, Kenyan importers can buy currency futures for firm orders when the local currency is strong with the expiry of the contracts bought close to when the date of importation. This ensures that the importer can import at a lower cost in an event of currency depreciation in the future.

From the results, the economic significance of foreign income is greater than that of relative prices of exports. This implies that benefit from increased foreign incomes can accrue to local exporters. This can be achieved by addressing the supply side constraints such as quality and safety standards in agricultural/horticultural exports as well as setting up promotion/marketing centres in Europe for Kenya's exports. On the demand side, value addition and adherence to the quality and safety standards in the EU market, should be prioritized. With increased globalization, demand has emerged for healthy food with emphasis on taste and aesthetics, thus demand for healthy, ethically produced high quality food, with the foreign consumers willing to pay more. The Export Promotion Council should map out the specialties that are being preferred abroad and promote them along the "healthy" food dimension. Kenya can also adopt the Indian strategy of 'focus market for focus products' by developing specific strategies for specific product markets. An establishment of a training institution alongside Export Promotion Council (EPC) to carry out training for existing and potential exporters, market surveys and research, product surveys and market based information dissemination.

The long run results indicate that an exchange rate depreciation improves trade balance between Kenya and EU in the long run. Although this study results support the view that exchange rate depreciation under floating exchange rate regime can improve trade balance, it proposes adoption of a managed float exchanged rate regime. Ogutu (2014) shows that a change in exchange rate regime did not affect Kenya's trade balance and therefore central bank interventions in devaluation would not affect the trade balance. However, the

manipulation of exchange rate policy should not be abused as the “always-go-to” tool at the expense of the country's macroeconomic variables.

5.5 Contribution to Knowledge

This study attempted to contribute to knowledge from the findings. First, the study finds that the domestic currency’s exchange rate misalignment follows volatility in periods of appreciation and depreciation. Second, the study finds that exchange misalignment has a negative effect on imports and insignificant on exports. Third, the study finds that Kenyan exports are highly responsive to foreign incomes. Fourth, Kenya’s exports are positively related to prices of exports. These contributions are useful to Central Bank of Kenya especially in monitoring of the exchange movement particularly in periods of political risk, during appreciation and during depreciation. The findings are also important to stakeholders in agricultural sector, involved in the international trade mainly in developing hedging instruments, designing and implementing marketing strategies as well as educating farmers on the safety regulations and diversification of export crops.

5.5 Areas for Further Research

The scope of this study was limited on the effect of exchange rate on trade flows between Kenya and EU. Further researcher should be pursued for other economic blocs such EAC, COMESA and other emerging trade destinations such as China. The EPAs trade arrangement should also be evaluated along some of the findings of this study.

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APPENDICES

Table A1 General ARDL Equation

Dependent Variable: LREER1
Method: ARDL
Sample (adjusted): 2001Q2 2016Q4
Included observations: 63 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): GOV1 LNFA1 LPROD1 TAR1 OIL1 OPE1 TOT1
Fixed regressors: C
Number of models evalulated: 312500
Selected Model: ARDL(4, 3, 4, 3, 3, 4, 3, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LREER1(-1)	0.088068	0.136587	0.644775	0.5241
LREER1(-2)	-0.450223***	0.132394	-3.400629	0.0020
LREER1(-3)	0.140812	0.133709	1.053122	0.3010
LREER1(-4)	-0.290509**	0.130554	-2.225201	0.0340
GOV1	-0.003105	0.024914	-0.124628	0.9017
GOV1(-1)	-0.004206	0.029435	-0.142891	0.8874
GOV1(-2)	0.056585	0.029464	1.920479	0.0647
GOV1(-3)	0.058857**	0.026812	2.195174	0.0363
LNFA1	0.156535*	0.076707	2.040687	0.0505
LNFA1(-1)	0.039796	0.079062	0.503352	0.6185
LNFA1(-2)	0.227796***	0.077402	2.943025	0.0063
LNFA1(-3)	-0.025682	0.076054	-0.33768	0.7380
LNFA1(-4)	0.228986***	0.077337	2.960885	0.0061
LPROD1	0.258460**	0.115588	2.236045	0.0332
LPROD1(-1)	-0.126879	0.106842	-1.18754	0.2447
LPROD1(-2)	0.232106*	0.123981	1.872109	0.0713
LPROD1(-3)	0.171108*	0.100260	1.706643	0.0986
TAR1	-0.006907	0.041022	-0.16837	0.8674
TAR1(-1)	0.009436	0.049382	0.191082	0.8498
TAR1(-2)	-0.093347*	0.049384	-1.89023	0.0688
TAR1(-3)	-0.089820*	0.045923	-1.95588	0.0602
OIL1	-0.000287	0.000262	-1.09542	0.2814
OIL1(-1)	0.000823**	0.000390	2.110256	0.0435
OIL1(-2)	-0.000896**	0.000360	-2.48889	0.0188
OIL1(-3)	-0.000102	0.000357	-0.28571	0.7779
OIL1(-4)	-0.000709*	0.000365	-1.94247	0.0619
OPE1	0.004850	0.003124	1.552497	0.1314
OPE1(-1)	-0.001076	0.003853	-0.27926	0.7821
OPE1(-2)	0.012477***	0.004357	2.863668	0.0077

OPE1(-3)	0.006772*	0.003594	1.884252	0.0696
TOT1	0.001504**	0.000719	2.091794	0.0454
TOT1(-1)	0.000966	0.000920	1.05	0.3024
TOT1(-2)	0.002859***	0.000801	3.569288	0.0013
C	-0.052520	0.012990	-4.043110	0.0004
R-squared	0.925268	Mean dependent var		-0.009004
Adjusted R-squared	0.876779	S.D. dependent var		0.039269
S.E. of regression	0.028405	Akaike info criterion		-3.980995
Sum squared resid	0.023398	Schwarz criterion		-2.824383
Log likelihood	159.4014	Hannan-Quinn criter.		-3.526094
F-statistic	2.712024	Durbin-Watson stat		1.611966
Prob(F-statistic)	0.003893			

[***], [**], and [*] denote significant levels at 1%, 5% and 10% respectively.

Table A2: Residual Properties of the Real Effective Exchange rate Equation

Type of test	Test statistic	Test statistic value	Probability
Normality test-Histogram	Jarque-Bera	3.61	0.16
Breusch-Godfrey Serial Correlation LM Test	Obs*R-squared	0.59	0.44
Heteroskedasticity Test: ARCH	Obs*R-squared	0.00	0.99

Table A3: Ramsey Reset Tests Results

Dependent Variable	F-statistic	Probability	Conclusion
Log of Real Effective Exchange Rate	0.32	0.58	No indication of misspecification error
Log of imports	0.04	0.72	No indication of misspecification error
Log of exports	0.24	0.63	No indication of misspecification error
Log of imports	0.46	0.50	No indication of misspecification error
Log of exports	0.56	0.22	No indication of misspecification error
Log of trade balance	0.27	0.61	No indication of misspecification error

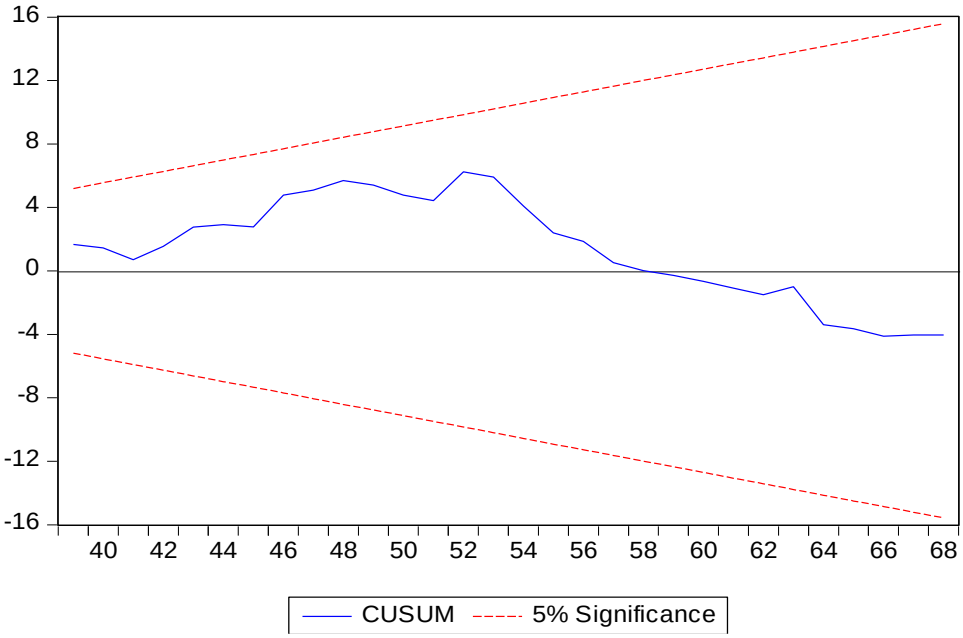

Figure A1 CUSUM Test from the Real Exchange Rate Equation

Table A4: Short-Run Effects of Economic Fundamentals on Real Effective Exchange Rate

Dependent variable: Real Effective Exchange Rate			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
Δ Government expenditure	-0.003105	-0.124632	0.9017
Δ Government expenditure lagged once	-0.056585*	-1.920522	0.0647
Δ Government expenditure lagged twice	-0.058857**	-2.195219	0.0363
Δ Net Foreign Assets	0.156535**	2.040698	0.0505
Δ Net Foreign Assets lagged once	-0.227796***	-2.943004	0.0063
Δ Net Foreign Assets lagged twice	0.025682	0.337680	0.7380
Δ Net Foreign Assets lagged thrice	-0.228986***	-2.960875	0.0061
Δ Productivity	0.258460**	2.236047	0.0332
Δ Productivity lagged once	-0.232106*	-1.872109	0.0713
Δ Productivity lagged twice	-0.171108*	-1.706638	0.0986
Δ Tax Revenue	-0.006907	-0.168385	0.8674
Δ Tax Revenue lagged once	0.093347*	1.890219	0.0688
Δ Tax Revenue lagged twice	0.089820*	1.955896	0.0602
Δ Oil Prices	-0.000287	-1.097635	0.2814
Δ Oil Prices lagged once	0.000896**	2.488455	0.0188
Δ Oil Prices lagged twice	0.000102	0.284648	0.7779
Δ Oil Prices lagged thrice	0.000709*	1.941930	0.0619
Δ Openness	0.004850	1.552561	0.1314
Δ Openness lagged once	-0.012477***	-2.863640	0.0077
Δ Openness lagged twice	-0.006772*	-1.884463	0.0696
Δ Terms of Trade	0.001504**	2.091257	0.0454
Δ Terms of Trade lagged once	-0.002859***	-3.569664	0.0013
ECT	-0.511853***	-5.121729	0.0000

Notes: [***], [**], and [*] denote significance at 1%, 5% and 10% levels

Δ denotes first difference operator. Source: Author's computations

Table A5 Real Exchange Rate Misalignment (%)

Year (Q)	REER	ERER	Misalignment (%)
2000 (Q1)	109.9		
2000 (Q2)	104.8		
2000 (Q3)	101.3		
2000 (Q4)	101.4		
2001(Q1)	103.6		
2001 (Q2)	100.3	99.2	-1.1
2001(Q3)	100.8	101.2	0.4
2001(Q4)	98.9	97.3	-1.6
2002(Q1)	100.6	104.0	3.4
2002(Q2)	99.8	98.1	-1.7
2002(Q3)	101.4	105.4	3.9
2002(Q4)	102.1	102.7	0.6
2003(Q1)	98.2	97.5	-0.7
2003(Q2)	89.2	91.0	2
2003(Q3)	99.6	105.5	5.9
2003(Q4)	98.1	100.9	2.9
2004(Q1)	98.1	100.8	2.8
2004(Q2)	96	95.5	-0.5
2004(Q3)	92.1	92.0	-0.1
2004(Q4)	94.2	95.2	1.1
2005(Q1)	88.2	87.3	-1
2005(Q2)	85.3	81.8	-4.1
2005(Q3)	84.5	85.0	0.6
2005(Q4)	80.4	79.4	-1.2

2006(Q1)	**78**	**77.6**	**-0.5**
2006(Q2)	**81.4**	**81.7**	**0.4**
2006(Q3)	**80.3**	**76.1**	**-5.2**
2006(Q4)	**75.9**	**75.2**	**-0.9**
2007(Q1)	**77.2**	**78.6**	**1.8**
2007(Q2)	**75.2**	**74.4**	**-1**
2007(Q3)	**75.3**	**74.8**	**-0.7**
2007(Q4)	**70.9**	**70.5**	**-0.6**
2008(Q1)	**71.4**	**70.6**	**-1.1**
2008(Q2)	**66.8**	**66.3**	**-0.8**
2008(Q3)	**70.9**	**70.8**	**-0.2**
2008(Q4)	**70.2**	**70.3**	**0.1**
2009(Q1)	**71.2**	**71.6**	**0.6**
2009(Q2)	**71.8**	**71.8**	**0**
2009(Q3)	**70.5**	**70.5**	**0**
2009(Q4)	**70.4**	**70.6**	**0.3**
2010(Q1)	**71.2**	**71.3**	**0.2**
2010(Q2)	**73**	**74.4**	**1.9**
2010(Q3)	**74.5**	**74.9**	**0.5**
2010(Q4)	**73.9**	**75.7**	**2.4**
2011(Q1)	**75.5**	**75.8**	**0.4**
2011(Q2)	**77.2**	**80.2**	**3.9**
2011(Q3)	**80**	**80.0**	**0**
2011(Q4)	**68.1**	**65.9**	**-3.3**
2012(Q1)	**65.1**	**63.3**	**-2.7**

2012(Q2)	**64.9**	**64.2**	**-1.1**
2012(Q3)	**66.8**	**66.7**	**-0.1**
2012(Q4)	**66.7**	**67.8**	**1.7**
2013(Q1)	**64.4**	**63.4**	**-1.6**
2013(Q2)	**63.3**	**62.4**	**-1.4**
2013(Q3)	**63.6**	**61.8**	**-2.9**
2013(Q4)	**62.9**	**62.2**	**-1.1**
2014(Q1)	**62.2**	**62.3**	**0.2**
2014(Q2)	**62.1**	**62.0**	**-0.2**
2014(Q3)	**61.3**	**61.3**	**0**
2014(Q4)	**60.5**	**60.5**	**0**
2015(Q1)	**58.2**	**58.2**	**0**
2015(Q2)	**60.9**	**60.4**	**-0.9**
2015(Q3)	**64.4**	**65.2**	**1.2**
2015(Q4)	**60.6**	**58.2**	**-3.9**
2016(Q1)	**59.8**	**59.5**	**-0.5**
2016(Q2)	**59.2**	**58.8**	**-0.6**
2016(Q3)	**59.3**	**60.2**	**1.6**
2016(Q4)	**58.8**	**60.2**	**2.3**

Table A6 General ARDL for Imports Equation

Dependent Variable: LM
Method: ARDL
Sample (adjusted): 2002Q2 2016Q4
Included observations: 59 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (6 lags, automatic): LGDP RPM FX MIS LOPEN REER
Fixed regressors: C
Number of models evalulated: 117649
Selected Model: ARDL(1, 3, 1, 5, 4, 5, 6)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LM(-1)	0.276287*	0.145104	1.904062	0.0676
LGDP	-0.196761	0.124123	-1.58521	0.1246
LGDP(-1)	0.062881	0.129915	0.484016	0.6323
LGDP(-2)	0.134865	0.133083	1.01339	0.3199
LGDP(-3)	0.353107**	0.128730	2.743005	0.0107
RPM	-0.211264***	0.102719	-2.05672	0.0000
RP(-1)	-0.150159	0.173949	-0.86324	0.3956
FX	-0.009048	0.007643	-1.18383	0.2468
FX(-1)	0.012731	0.007715	1.650162	0.1105
FX(-2)	-0.004145	0.007926	-0.52296	0.6053
FX(-3)	0.016423*	0.008687	1.890526	0.0695
FX(-4)	0.017868*	0.010198	1.752108	0.0911
FX(-5)	-0.017134*	0.009517	-1.80036	0.0830
MIS	0.018441	0.020055	0.919521	0.3660
MIS(-1)	-0.034423*	0.019353	-1.77869	0.0866
MIS(-2)	-0.001533	0.020847	-0.07354	0.9419
MIS(-3)	-0.042588***	0.020699	-2.05749	0.0094
MIS(-4)	-0.034458	0.021622	-1.59365	0.1227
LOPEN	0.219017*	0.108833	2.012414	0.0542
LOPEN(-1)	0.260961*	0.134311	1.942961	0.0625
LOPEN(-2)	0.177901	0.126503	1.406299	0.1710
LOPEN(-3)	-0.058326	0.131788	-0.44257	0.6616
LOPEN(-4)	-0.127524	0.126661	-1.00681	0.3230
LOPEN(-5)	-0.167501	0.115893	-1.44531	0.1599
REER	-0.014835*	0.005938	-2.49832	0.0189
REER(-1)	0.005068	0.005673	0.893354	0.3796
REER(-2)	0.000323	0.005933	0.054441	0.9570
REER(-3)	-0.001147	0.005891	-0.1947	0.8470
REER(-4)	0.004740	0.006137	0.772364	0.4466
REER(-5)	-0.005917	0.005671	-1.04338	0.3061
REER(-6)	-0.009769*	0.005109	-1.91212	0.0665
C	12.36116***	2.525385	4.894763	0.0000

R-squared	0.871421	Mean dependent var	10.03257
Adjusted R-squared	0.838607	S.D. dependent var	0.384354
S.E. of regression	0.095233	Akaike info criterion	-1.561926
Sum squared resid	0.244874	Schwarz criterion	-0.435126
Log likelihood	78.07680	Hannan-Quinn criter.	-1.122068
F-statistic	29.60451	Durbin-Watson stat	2.287378
Prob(F-statistic)	0.000000		

Notes: [***], [**], and [*] denote significance at 1%, 5% and 10% levels
Source: Author's computations

Table A7: Residual Properties of the Import Equation

Type of test	Test statistic	Test statistic value	Probability
Normality test-Histogram	Jarque-Bera	0.57	0.75
Breusch-Godfrey Serial Correlation LM Test	Obs*R-squared	2.04	0.10
Heteroskedasticity Test: ARCH	Obs*R-squared	1.25	0.26

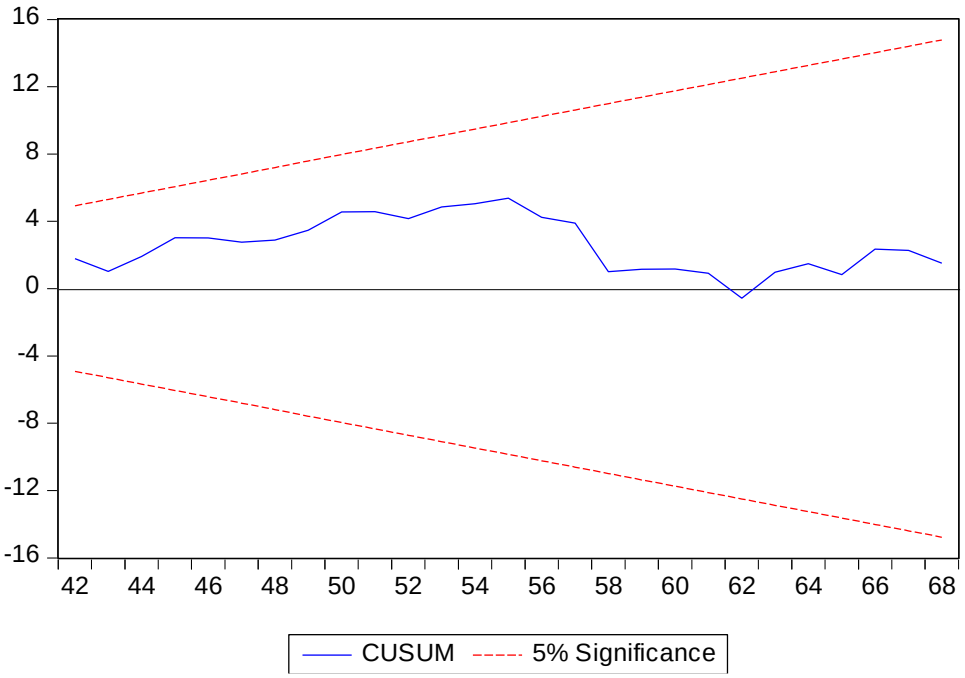

Figure A2 CUSUM Test for the Import Equation

Table A8 General ARDL for Exports Equation

Dependent Variable: LX
Method: ARDL
Sample (adjusted): 2001Q2 2016Q4
Included observations: 63 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (6 lags, automatic): LGDPF LRP LREER MIS LOPEN
Fixed regressors: C
Number of models evalulated: 16807
Selected Model: ARDL(1, 5, 2, 1, 0, 5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LX(-1)	0.427656***	0.112155	3.81308	0.0004
LGDPF	-1.444353	3.581138	-0.40332	0.6887
LGDPF(-1)	3.891906	7.058991	0.55134	0.5843
LGDPF(-2)	-1.435506	7.298889	-0.19667	0.8450
LGDPF(-3)	-3.049987	7.232678	-0.4217	0.6753
LGDPF(-4)	-6.165808	6.709549	-0.91896	0.3632
LGDPF(-5)	13.96040***	3.826929	3.647938	0.0007
LRP	0.294316***	0.071857	4.095857	0.0002
LRP(-1)	0.375717***	0.088027	4.268202	0.0001
LRP(-2)	-0.146139	0.089581	-1.63136	0.1101
LREER	0.026980	0.400658	0.067339	0.9466
LREER(-1)	0.576002	0.358310	1.607552	0.1153
MIS	0.020143	0.017470	1.153005	0.2553
LOPEN	0.462277***	0.107302	4.308186	0.0001
LOPEN(-1)	-0.224506	0.150316	-1.49356	0.1426
LOPEN(-2)	0.186018	0.136601	1.361762	0.1804
LOPEN(-3)	-0.070409	0.133172	-0.52871	0.5997
LOPEN(-4)	-0.116304	0.131210	-0.8864	0.3803
LOPEN(-5)	-0.469608***	0.130155	-3.60807	0.0008
C	-2.959673	3.076327	-0.96208	0.3414
R-squared	0.854691	Mean dependent var		9.766669
Adjusted R-squared	0.824671	S.D. dependent var		0.357065
S.E. of regression	0.091264	Akaike info criterion		-1.697126
Sum squared resid	0.358155	Schwarz criterion		-1.016766
Log likelihood	73.45948	Hannan-Quinn criter.		-1.429537
F-statistic	47.68616	Durbin-Watson stat		2.304397
Prob(F-statistic)	0.000000			

Notes: [***], [**], and [*] denote significance at 1%, 5% and 10% levels
Source: Author's computations

Table A9: Residual Properties of the Export Equation

Type of test	Test statistic	Test statistic value	Probability
Normality test-Histogram	Jarque-Bera	3.19	0.20
Breusch-Godfrey Serial Correlation LM Test	Obs*R-squared	4.26	0.11
Heteroskedasticity Test: ARCH	Obs*R-squared	0.34	0.55

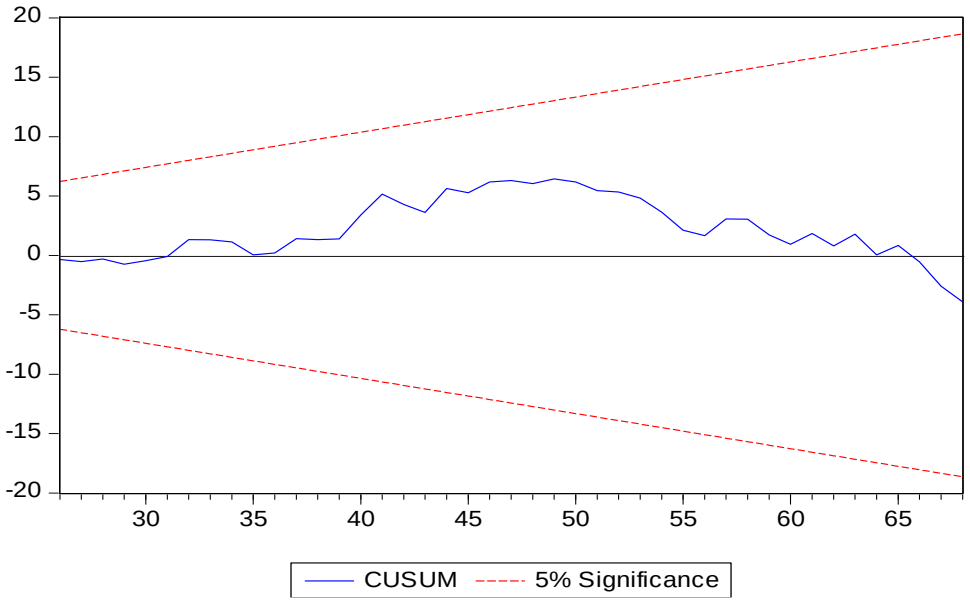

Figure A3 CUSUM Test for the Export Equation

Table A10: General ARDL for Trade Balance Equation

Dependent Variable : LTB
Method : ARDL
Sample (adjusted) : 2001Q3 2016Q4
Included observations : 62 after adjustments
Maximum dependent lags : 6 (Automatic selection)
Model selection method : Akaike info criterion (AIC)
Dynamic regressors (6 lags, automatic) : LFR LGDP LGDPF LINFL LM3 LREER LTOT
Fixed regressors : C
Number of models evaluated: 4941258

Selected Model : ARDL(6, 6, 6, 6, 6, 6, 6, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LTB(-1)	-0.361974**	0.135162	-2.67808	0.0253
LTB(-2)	-0.289624	0.191951	-1.50884	0.1656
LTB(-3)	-0.217971*	0.104659	-2.08268	0.0670
LTB(-4)	0.143014	0.120061	1.191178	0.2640
LTB(-5)	0.174205	0.105193	1.656051	0.1321
LTB(-6)	0.346318**	0.138333	2.50351	0.0337
LFX	0.257803**	0.095223	2.707361	0.0241
LFX(-1)	-0.265652**	0.108870	-2.44008	0.0374
LFX(-2)	0.626590	0.096892	6.466891	0.9555
LFX(-3)	-0.006844***	0.119252	-0.05739	0.0001
LFX(-4)	-0.433589***	0.116481	-3.7224	0.0048
LFX(-5)	-0.579364***	0.165565	-3.49931	0.0067
LFX(-6)	-0.330603**	0.109327	-3.02398	0.0144
LGDP	1.068630	0.251195	4.254185	0.4021
LGDP(-1)	-0.041331	0.134682	-0.30688	0.7659
LGDP(-2)	-1.009720***	0.145845	-6.92324	0.0001
LGDP(-3)	-0.375288*	0.181020	-2.07319	0.0680
LGDP(-4)	-1.283305***	0.270413	-4.74572	0.0011
LGDP(-5)	-0.267400*	0.145068	-1.84327	0.0984
LGDP(-6)	0.254263	0.262382	0.969057	0.3578
LGDPF	-5.829583	3.610776	-1.6145	0.1409
LGDPF(-1)	7.054523*	3.584193	1.968232	0.0806
LGDPF(-2)	-4.198654	3.938594	-1.06603	0.3142
LGDPF(-3)	18.44730***	4.717309	3.910556	0.0036
LGDPF(-4)	-9.168078**	3.398133	-2.69798	0.0245
LGDPF(-5)	0.637161	2.819461	0.225987	0.8263
LGDPF(-6)	4.520232*	2.140083	2.112176	0.0638
LINFL	0.124426	0.094750	1.313203	0.2216
LINFL(-1)	0.048631	0.072433	0.671393	0.5188
LINFL(-2)	-0.192098**	0.077546	-2.47721	0.0352
LINFL(-3)	0.458175***	0.082626	5.545167	0.0004
LINFL(-4)	-0.327443***	0.080128	-4.0865	0.0027

LINFL(-5)	-0.059602	0.084075	-0.70891	0.4963
LINFL(-6)	-0.157928**	0.061210	-2.5801	0.0297
LM3	-0.801619	1.878112	-0.42682	0.6795
LM3(-1)	3.627040*	1.866067	1.943682	0.0838
LM3(-2)	0.068097	2.100329	0.032422	0.9748
LM3(-3)	-12.97343***	2.756837	-4.70591	0.0011
LM3(-4)	0.768098	3.196988	0.240257	0.8155
LM3(-5)	-8.742752***	2.523912	-3.46397	0.0071
LM3(-6)	17.32296***	2.315340	7.481821	0.0000
LREER	3.118452***	0.672921	4.634202	0.0012
LREER(-1)	1.978823**	0.657828	3.008116	0.0148
LREER(-2)	-0.505278	0.757152	-0.66734	0.5213
LREER(-3)	3.253120***	0.884122	3.679492	0.0051
LREER(-4)	-0.365916	0.810201	-0.45164	0.6622
LREER(-5)	-2.021884**	0.727666	-2.77859	0.0215
LREER(-6)	1.178239	0.742423	1.587018	0.1470
LTOT	0.736612**	0.257080	2.865303	0.0186
LTOT(-1)	-0.963382***	0.256647	-3.75372	0.0045
LTOT(-2)	-0.864236***	0.186590	-4.63174	0.0012
LTOT(-3)	-0.388536*	0.192720	-2.01606	0.0746
C	-112.4612***	23.68019	-4.74917	0.0010
R-squared	0.882869	Mean dependent var		-0.228458
Adjusted R-squared	0.783887	S.D. dependent var		0.205168
S.E. of regression	0.069912	Akaike info criterion		-2.703398
Sum squared resid	0.043989	Schwarz criterion		-0.885041
Log likelihood	136.8053	Hannan-Quinn criter.		-1.989465
F-statistic	9.929850	Durbin-Watson stat		2.411043
Prob(F-statistic)	0.000472			

Notes: [***], [**], and [*] denote significance at 1%, 5% and 10% levels
Source: Author's computations

Table A11: Residual Properties of the Trade Balance Equation

Type of test	Test statistic	Test statistic value	Probability
Normality test-Histogram	Jarque-Bera	0.68	0.70
Breusch-Godfrey Serial Correlation LM Test	Obs*R-squared	3.47	0.06
Heteroskedasticity Test: ARCH	Obs*R-squared	0.02	0.87

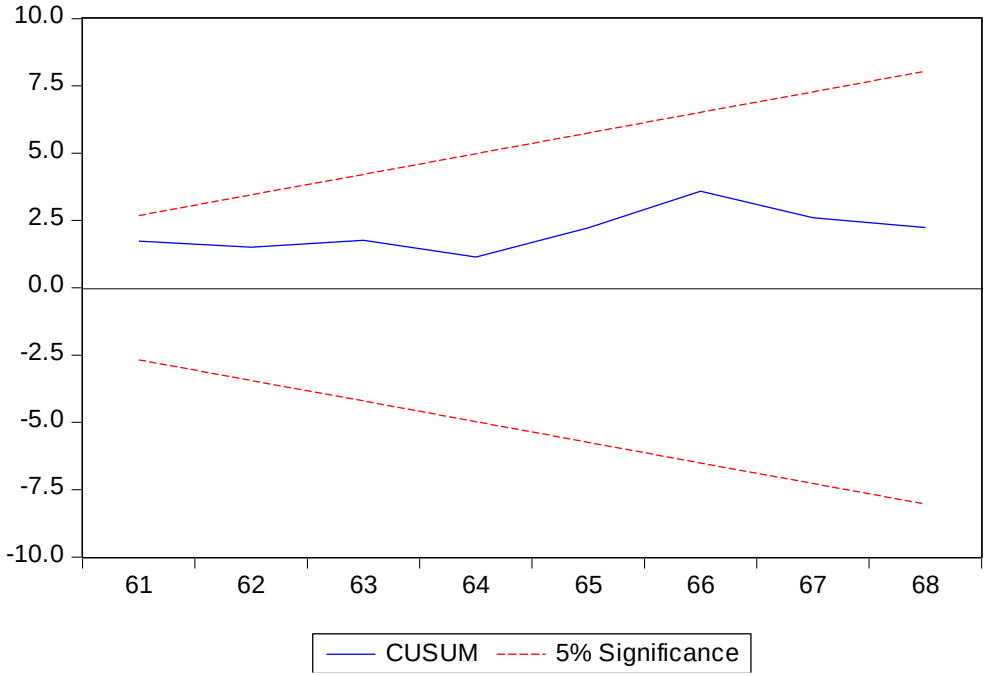

Figure A4: CUSUM Test for the Trade Balance Equation

Table A12: ARDL Bounds Test for Cointegration

Dependent variable	I(1) Bound	F-statistic	K	Conclusion
Log of real effective exchange rate	4.26	4.65	7	Existence of cointegration
Log of imports	4.43	4.70	6	Existence of cointegration
Log of exports	4.68	5.32	5	Existence of cointegration
Log of imports	4.68	5.40	5	Existence of cointegration
Log of exports	4.68	6.62	5	Existence of cointegration
Log of Trade Balance	4.26	16.11	7	Existence of cointegration

Table A13: Results of the Stationarity Test

	KPSS LM statistic		
Variable	**Level**	**First difference**	**Order of Integration**
Foreign reserves		0.397***	I(1)
Gross Domestic Product		0.619**	I(1)
Foreign Gross Domestic product		0.078***	I(1)
Government Expenditure	0.605***		I(0)
Inflation	0.065***		I(0)
Money supply (M3)		0.715***	I(1)
Real Effective Exchange Rate		0.217***	I(1)
Trade Balance	0.073***		I(0)
Terms of Trade		0.396***	I(1)
Net Foreign Assets		0.364***	I(1)
Productivity		0.722***	I(1)
Volatility	0.615***		I(0)
Relative Prices of Imports		0.263***	I(1)
Relative Prices of Exports	0.411***		I(0)
Tax Revenue		0.152***	I(1)
World Oil Prices		0.184***	I(1)
Trade Openness		0.739***	I(1)
Misalignment	0.180***		I(0)
Exports	0.213***		I(0)
Imports		0.098***	I(1)

[***], and [**] denote significant levels at 1%, and 5%
Source: Author's Computations

Table A14: Data Used in the Study

Year	X (KES Bn)	M (KES Bn)	RPM (Ratio)	RPX (Ratio)	REER (Index)	GDP (KES Bn)	FR (KES Bn)	Open (Ratio)	Mis (%)	Gov (%)	MS (KES Bn)	GDPF (Bn Euro)	OIL (USD /Bar)	NFA (KES Bn)	TAR (%)	Prod (%)	ToT (Ratio)	INF (%)	TB (Ratio)
2000	8.2	10.3			109.9	243.4	61.3	13.7		0.57	309.4	2368.1	26.77	58.5	0.45	16.30		7.7	0.80
2000	9.1	13.4			104.8	242	62.8	13.2		0.72	310.4	2404.6	26.54	64.5	0.63	16.50		9.0	0.68
2000	8.4	12.9			101.3	243.7	67.5	12.9		0.20	308.6	2430.5	30.34	75.8	0.15	17.20		11.5	0.65
2000	9.8	12.7			101.4	246.9	69.6	11.5		0.42	314.7	2463.3	29.58	82.2	0.31	18.10		11.6	0.77
2001	11.2	14.2			103.6	248.9	73.4	15.1		0.67	308.9	2472.1	25.82	87.8	0.46	18.30		10.5	0.79
2001	9.3	14.6			100.3	259.9	75.3	16.5	-1.1	0.90	305.1	2517.3	27.24	87.8	0.63	18.30		6.8	0.64
2001	7.5	12.6			100.8	258.6	83.2	13.1	0.4	0.19	310.6	2523.4	25.25	89.5	0.14	18.60		3.8	0.60
2001	8.5	11.1			98.9	252.7	83.5	10.6	-1.6	0.40	322.3	2546.7	19.34	90.7	0.30	19.40		2.3	0.76
2002	10.7	15.5			100.6	261.1	83.9	13.5	3.4	0.60	320.9	2581.8	21.15	90.8	0.44	18.70		1.2	0.69
2002	9.9	10.4			99.8	256.8	89.5	14.3	-1.7	0.88	331.6	2593.8	25.07	98.8	0.62	17.50		1.8	0.96
2002	9.7	10.6			101.4	251.6	88.3	13.7	3.9	0.23	335.9	2613.3	26.91	98.4	0.15	16.60		1.9	0.91
2002	9.5	11.4			102.1	255.7	82.4	13.7	0.6	0.47	350.8	2636.8	26.86	103.5	0.32	16.40		2.9	0.83
2003	13.4	11.1			98.2	258.6	90.9	14.5	-0.7	0.70	352.7	2625.7	31.43	105.6	0.48	16.20		8.0	1.21
2003	10.8	11.9			89.2	259.4	93.1	15.6	2	1.02	362.6	2619.4	26.13	104.6	0.68	16.60		13.4	0.91
2003	10.2	10.8			99.6	267.2	103.8	14.0	5.9	0.23	370.3	2655	28.44	117	0.16	16.80		9.0	0.94
2003	11.9	11.6			98.1	269.4	112.4	15.0	2.9	0.45	395.1	2686.3	29.41	122.4	0.34	16.80		8.8	1.02
2004	12.2	12.3			98.1	277.7	108.7	16.7	2.8	0.68	394.8	2725.2	31.95	132.1	0.51	16.90		9.1	0.99
2004	12.7	12.6			96.0	272.4	111	17.8	-0.5	1.04	407.3	2769.8	35.49	132.5	0.74	17.00		6.0	1.01
2004	11.1	14.8			92.1	274.3	106	17.2	-0.1	0.24	416.9	2791.4	41.59	131.2	0.19	17.40		14.4	0.75

Year	X (KES Bn)	M (KES Bn)	RPM (Ratio)	RPX (Ratio)	REER (Index)	GDP (KES Bn)	FR (KES Bn)	Open (Ratio)	Mis (%)	Gov (%)	MS (KES Bn)	GDPF (Bn Euro)	OIL (USD /Bar)	NFA (KES Bn)	TAR (%)	Prod (%)	ToT (Ratio)	INF (%)	TB (Ratio)
2004	13.6	19.8			94.2	284	117.3	20.4	1.1	0.47	432.6	2808.3	44.16	140.4	0.41	17.50		17.6	0.69
2005	14.9	19.5	0.05	0.03	88.2	284.6	107.8	20.7	-1	0.71	434.9	2835.1	47.64	150.7	0.61	17.60	0.64	14.3	0.76
2005	15.4	21.4	0.07	0.04	85.3	292.3	121.2	23.3	-4.1	1.04	442.4	2884.8	51.61	154.8	0.83	17.80	0.54	14.2	0.72
2005	11.3	23.1	0.06	0.03	84.5	295.7	126.8	19.0	0.6	0.29	453.8	2914.1	61.55	154.6	0.20	18.10	0.55	7.5	0.49
2005	13.3	29.6	0.05	0.03	80.4	301.5	130.6	19.4	-1.2	0.59	474.9	2963.2	56.93	156.7	0.41	18.20	0.50	4.4	0.45
2006	15.1	22.9	0.06	0.03	78.0	303.1	142.8	20.4	-0.5	0.89	492.6	2999	61.91	174.1	0.61	18.30	0.49	8.4	0.66
2006	14.1	14.0	0.06	0.03	81.4	309.9	174.7	20.7	0.4	1.21	521.9	3043.8	69.83	190.2	0.83	18.40	0.48	4.3	1.01
2006	13.5	19.6	0.06	0.03	80.3	318.4	175.4	20.6	-5.2	0.30	537.7	3086.7	70.09	201.7	0.21	18.50	0.52	4.9	0.69
2006	14.7	19.4	0.06	0.03	75.9	317.4	168.4	20.4	-0.9	0.60	553.9	3144	59.72	208.1	0.44	18.60	0.45	6.6	0.76
2007	15.9	18.7	0.07	0.03	77.2	325.1	174.3	21.2	1.8	0.92	576.3	3202	58.07	220.4	0.65	19.00	0.47	3.4	0.85
2007	15.2	20.0	0.06	0.03	75.2	334.8	177.7	21.7	-1	1.21	605.5	3230.9	68.73	222.8	0.91	19.50	0.48	2.7	0.76
2007	14.8	23.7	0.06	0.03	75.3	337.3	184.9	20.6	-0.7	0.28	631.1	3269.6	75.04	225.5	0.26	19.90	0.46	5.3	0.63
2007	17.2	18.9	0.06	0.03	70.9	339.6	225.8	16.4	-0.6	0.65	666.9	3296.5	89.01	255.4	0.51	20.50	0.46	5.6	0.91
2008	22.1	20.4	0.06	0.03	71.4	329.4	211.5	24.5	-1.1	1.09	697.1	3298.6	96.67	249.6	0.79	20.20	0.49	10.5	1.08
2008	18.2	15.8	0.06	0.03	66.8	342.5	221.6	22.0	-0.8	1.56	715.9	3287.4	122.48	291.3	1.06	20.00	0.50	17.4	1.15
2008	17.6	20.7	0.07	0.03	70.9	345.6	229.1	30.0	-0.2	0.32	736.3	3283.8	115.60	254.1	0.27	19.70	0.42	15.9	0.85
2008	19.9	26.3	0.08	0.03	70.2	343.5	221.5	28.5	0.1	0.77	766.4	3192.2	55.9	249.5	0.58	19.60	0.45	16.6	0.76
2009	21.3	22.0	0.08	0.04	71.2	701.9	215.7	13.2	0.6	1.12	780.5	3050.8	44.9	256.3	0.44	19.50	0.49	14.1	0.97
2009	18.5	21.7	0.08	0.03	71.8	714.8	244.6	12.8	0	1.72	812.1	3063.6	59.1	268	0.58	19.40	0.44	10.6	0.85

Year	X (KES Bn)	M (KES Bn)	RPM (Ratio)	RPX (Ratio)	REER (Index)	GDP (KES Bn)	FR (KES Bn)	Open (Ratio)	Mis (%)	Gov (%)	MS (KES Bn)	GDPF (Bn Euro)	OIL (USD /Bar)	NFA (KES Bn)	TAR (%)	Prod (%)	ToT (Ratio)	INF (%)	TB (Ratio)
2009	19.1	24.7	0.08	0.04	70.5	713.7	247.8	13.6	0	0.46	849.2	3092.1	68.4	255.3	0.15	19.50	0.47	9.8	0.77
2009	21.0	21.0	0.08	0.03	70.4	733.2	260.2	14.9	0.3	0.84	898.1	3100.7	74.9	243.8	0.31	19.30	0.39	8.0	1.00
2010	23.1	20.8	0.08	0.04	71.2	792.2	256	14.9	0.2	1.39	959	3136.5	76.7	268.2	0.42	19.50	0.49	5.5	1.11
2010	20.3	22.8	0.08	0.03	73.0	776.1	307.5	14.8	1.9	2.17	1033.7	3197.3	78.7	280.3	0.62	19.70	0.43	3.7	0.89
2010	17.7	23.1	0.08	0.03	74.5	773.1	316.9	15.7	0.5	0.44	1078.3	3235.2	76.4	278.1	0.15	19.90	0.43	3.3	0.77
2010	22.6	40.1	0.08	0.03	73.9	827.9	313.1	16.4	2.4	0.95	1099.2	3250.5	86.8	269.8	0.31	20.10	0.40	3.8	0.56
2011	24.8	21.7	0.08	0.03	75.5	938.5	333.4	16.7	0.4	1.48	1145	3299.6	104.9	286.1	0.41	20.20	0.42	7.0	1.15
2011	24.1	26.4	0.08	0.03	77.2	920.1	368	16.0	3.9	2.25	1183.9	3289.3	117.1	281.9	0.61	20.30	0.41	13.2	0.91
2011	23.3	31.5	0.08	0.03	80.0	914.5	394.1	18.5	0	0.47	1232.9	3299.9	112.5	310.1	0.15	20.50	0.38	16.5	0.74
2011	24.9	29.9	0.08	0.03	68.1	952.9	353.1	16.5	-3.3	1.10	1253.9	3307.9	109.3	295.2	0.30	20.70	0.37	19.2	0.83
2012	23.1	29.5	0.09	0.03	65.1	1085.4	378.8	15.6	-2.7	1.70	1276.4	3337.2	118.5	276.2	0.39	20.90	0.41	16.9	0.78
2012	22.9	32.2	0.09	0.03	64.9	1065.9	428.6	14.4	-1.1	2.30	1339.5	3353.5	108.9	321.8	0.59	21.00	0.36	11.8	0.71
2012	22.0	35.2	0.09	0.03	66.8	1037.3	457.2	14.4	-0.1	0.57	1409.8	3393.1	109.9	352	0.15	21.30	0.38	6.4	0.62
2012	23.6	36.3	0.09	0.03	66.7	1072.8	480.7	14.7	1.7	1.23	1469.4	3381	110.4	326	0.30	21.50	0.38	3.5	0.65
2013	24.6	29.8	0.09	0.03	64.4	1197.8	454.1	12.5	-1.6	1.87	1488	3361.1	112.9	319.6	0.40	21.20	0.38	4.1	0.83
2013	21.3	31.4	0.08	0.03	63.3	1192.9	518.5	11.4	-1.4	3.03	1565.4	3384.8	103.0	361.2	0.62	20.80	0.38	4.4	0.68
2013	20.0	32.8	0.09	0.03	63.6	1182	523.5	13.0	-2.9	0.20	1636.5	3404.3	110.10	372.8	0.17	20.11	0.35	7.0	0.61
2013	24.1	33.5	0.09	0.03	62.9	1172.4	535.3	13.6	-1.1	0.44	1683.2	3430	109.40	387.7	0.36	20.17	0.34	7.4	0.72
2014	26.9	37.9	0.09	0.03	62.2	1361.9	562.7	12.1	0.2	0.52	1775.3	3466.5	107.93	370.5	0.45	20.45	0.40	6.8	0.71

Year	X (KES Bn)	M (KES Bn)	RPM (Ratio)	RPX (Ratio)	REER (Index)	GDP (KES Bn)	FR (KES Bn)	Open (Ratio)	Mis (%)	Gov (%)	MS (KES Bn)	GDPF (Bn Euro)	OIL (USD /Bar)	NFA (KES Bn)	TAR (%)	Prod (%)	ToT (Ratio)	INF (%)	TB (Ratio)
2014	26.2	34.1	0.10	0.03	62.1	1363.3	564.1	11.6	-0.2	0.97	1850.6	3492.3	109.81	529.4	0.62	20.52	0.36	7.0	0.77
2014	24.0	36.0	0.11	0.03	61.3	1351.4	671.5	14.7	0	0.20	1907.2	3532.7	102.08	446.5	0.16	21.53	0.30	7.5	0.67
2014	21.9	34.2	0.10	0.03	60.5	1325.9	704.4	12.6	0	0.46	1996.3	3560.2	75.96	479.7	0.34	21.64	0.31	6.2	0.64
2015	28.3	29.9	0.09	0.04	58.2	1570.4	685.8	10.8	0	0.89	2060.4	3639.8	54.05	462.1	0.45	21.79	0.38	5.8	0.95
2015	22.5	35.5	0.10	0.03	60.9	1601.3	685.2	11.4	-0.9	1.13	2154.5	3693.8	62.10	435.5	0.62	21.85	0.34	7.0	0.63
2015	29.3	39.2	0.09	0.04	64.4	1581	665.8	12.0	1.2	0.18	2150.9	3718.6	50.03	389.7	0.16	21.92	0.42	6.1	0.75
2015	25.0	29.5	0.10	0.04	60.6	1531.4	742.7	10.6	-3.9	0.55	2,252.8	3740.2	43.42	491.5	0.34	21.05	0.37	7.4	0.85
2016	31.1	29.2	0.08	0.04	59.8	1692.4	773	10.3	-0.5	0.72	2,281.6	3721.7	34.36	471.8	0.46	20.03	0.50	7.1	1.07
2016	26.1	32.2	0.09	0.04	59.2	1929.3	818.3	9.7	-0.6	0.97	2,353.4	3732.7	45.95	562.5	0.58	19.57	0.40	5.0	0.81
2016	23.2	29.3	0.09	0.03	59.3	1882.1	802.9	9.3	1.6	0.20	2,340.2	3710	45.80	591.9	0.15	18.41	0.39	6.3	0.79
2016	24.3	30.4	0.09	0.03	58.8	1690.4	736.5	9.1	2.3	0.48	2,360.2	3732.1	50.08	495.2	0.35	17.47	0.38	6.5	0.80

Source:

Broad money supply M2 (MS): Central Bank of Kenya
Net Foreign Assets (NFA): Central Bank of Kenya
GDP: Kenya National Bureau of Statistics
Imports and exports: Central Bank of Kenya
Inflation (INF): Central Bank of Kenya
Real Effective Exchange Rate: Central Bank of Kenya
Foreign Reserves (FR): Central Bank of Kenya
Global Price of Brent Crude Oil: FRED Economic Data. Federal Reserve Bank of St. Louis
Terms of Trade: prices reported in the World Economic Indicators