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THE MONETARY APPROACH TO EXCHANGE RATE DETERMINATION: EVIDENCE FROM KENYA (2000 - 2012)

BY:

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DECLARATION

I hereby declare that this is my original work and has not been presented in this or any other university for the award of a degree.

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DEDICATION

I dedicate this project to my late grandmother Taplangoi who patiently and persistently molded my life and my Dad the late Kipkoros Arap Lang'at and Mum Taputany for their faith in me and to my wife Eunice and sons Kimutai and Kiprono who gave me inspiration in my studies.

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TABLE OF CONTENTS

LIST OF TEXT TABLES

Page

DEFINITION OF TERMS

Balance of Payments (BOP)	A statement showing the net exchange of a nation's currency for foreign currencies from all transactions between that nation and foreign nations in a given year.
Balance of Trade	The difference between the value of merchandise exported by a nation's firms and the nation's imports of foreign produced goods.
Exchange Rate	The price of one nation's monetary unit in terms of the monetary unit of another nation.
Central Bank Rate	The lowest rate of interest that the Central Bank charges on overnight loans to commercial banks
Purchasing Power Parity Theory	An economic theory that estimates the amount of adjustment needed on the exchange rate between countries in order for the exchange to be equivalent to each currencies purchasing power

LIST OF ACRONYMS AND ABBREVIATIONS

BOP	Balance of Payments
CBK	Central Bank of Kenya
GDP	Gross Domestic Product
MA	Monetary approach
MAERD	Monetary approach to Exchange rate Determination
MAER	Monetary Approach to Exchange Rates
PPP	Purchasing Power Parity
PPPT	Purchasing power parity Theory
TOT	Terms of Trade
US	United States of America
VECM	Vector Error Correction Model
OECD	The Organization for Economic Co operation and Development
USA	United States of America
GMM	Generalized Moments Method

ABSTRACT

The objective of this paper was to test the relevance of the monetary approach to exchange rate determination in Kenya. In particular, the paper was anchored on two theoretical underpinnings, the purchasing power parity theory and the money market equilibrium conditions. The study findings indicate that changes in ratio between Kenya's broad money supply to US broad money does not significantly affect the Ksh/USD nominal exchange rate. This means that the monetary policy approach to exchange rate determination theory is weak when cast on the Kenyan case using the US dollar –Kenya shilling pair of the exchange rate. The estimation was carried out using the Generalized Method of Moments (GMM) in order to reduce any form of multicollinearity in the macroeconomic set of variables

The money supply ratio, despite having the expected sign on its coefficient, is not significant in determining the exchange rate in Kenya. However, the study finds that the significant determinants of the KSH/USD nominal exchange rate are the ratio of domestic to foreign (USA) output and the interest rate differential (using Treasury bill rates) which have negative and positive impacts, respectively. Therefore policies that support relative increase in economic activity are beneficial to the strength of the currency. Similarly, the differential between Kenya's Treasury bill rate and the USA Treasury bill rate should be maintained at positive levels if the exchange rate were to remain stable.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The exports of most emerging countries are dominated by primary unprocessed products that are mainly agricultural. The imports on the other hand are composed of final and intermediate products such as automobiles, electronics and petroleum products. Consequently, the benefit of international trade is tilted against the young and less developed nations which explain the prevalence of balance of payments deficits in these countries. Like other similar countries Kenya's trade position has been impacted negatively by both internal and external factors which have largely mired the country from attaining meaningful trade surpluses since independence. To address this rather chronic malady the government of Kenya in the 1990s had to abandon fixed exchange rates in favor of a flexible regime with a raft of other policy changes under the auspices of the structural adjustment programmes.

It is at this point that the country entered a new phase in its economic history as it transitioned from a closed to an open economy. The capital account was fully opened as the interest rates were allowed to be market determined. These moves fully exposed the economy to the effects of globalization. Consequently the exchange rate continued to be driven by market forces of demand for and supply of foreign exchange. The effect of capital movements and variations in monetary conditions were manifested in the behavior of the Kenya shilling exchange rate against other currencies. The exchange rate being the price of a unit of a nation's currency in terms of units of foreign money significantly determines export and import prices as well as the value of capital flows (in domestic currency). To any nation, the performance of the exchange rate is crucial in determining economic performance in terms of competitiveness in international trade.

In response to dynamic changes in the local and foreign markets the Kenya shilling exchange rate exhibits significant variations against major currencies. A key driver to the fluctuations in the exchange rate has been the higher demand for foreign currency to purchase imports particularly oil which could not be matched by the value of foreign currency received from exports and capital inflows. For instance, the international oil prices rose from $ 77.50 per barrel in January 2010 to $ 120.70 per barrel in April 2011 significantly increasing Kenya's import bill

by 38 percent over the same period (CBK, 2012). Since then the price of crude oil has been maintained at a rate of over $ 100 per barrel which has buoyed the requirements for foreign exchange by importers to meet their purchases. The political unrest that rocked parts of the Middle East and Northern Africa states towards the end of 2010 is seen as a major contributor to the rise in international oil prices. The disturbances constrained the availability of oil in the international markets as production and distribution was hampered. Similarly, the 'Euro debt' crises coupled with the uncertainty of resolution ignited speculative tendencies in the global foreign exchange markets as international investors took cautious positions and transferred their investments to currencies they rated to be stable such as the dollar (CBK, 2012). These events mounted pressure on Kenya's exchange rate to depreciate with direct knock-on effects on overall inflation. The reaction of the CBK through the monetary policy committee was manifested in the upward adjustment of the Central Bank Rate from 11 percent to 18 percent at the end of 2011 which reflected the adoption of a tight monetary policy stance. This was aimed at reducing the pressure and volatility of the exchange rate and demand driven inflationary pressure. A tight monetary policy stance improves the country's interest rates differential with the rest of the world to enhance capital inflows thereby reducing pressure on the exchange rate. Through the exchange rate stability and reduced domestic demand pressure, the overall inflation problem is solved. This is usually the case with a country adopting a flexible floating exchange rate regime.

A floating exchange rate is necessary for countries with limited foreign exchange reserves to intervene in the market in the event of external shocks. In particular, the exchange rate would adjust instead of running down foreign reserves. In this case, the role of monetary policy management in a floating exchange rate regime is critical to achieve exchange rate stability (and price stability by extension). The dynamics of a floating exchange rate and indeed their empirical associations with relevant fundamentals in the economy calls for clear comprehension by monetary authorities as they craft policies to countermand external instabilities. Such a move will strengthen macroeconomic stability. There has been a lot of divergence as different policy approaches have been proposed in the analysis of the external balance based on the various theoretical expositions. The resultant recommendations have been divergent and occasionally contradictory.

1.2 Evolution of Kenya's Exchange Rate Regimes

When Kenya gained independence in 1963, the country pursued macroeconomic policies with the aim of nurturing and protecting the young economy. In the first two decades, policymakers adopted protectionist policies with the government determining, among others, interest rates, foreign exchange transactions, import and export licenses as well as domestic prices. The effectiveness of controls waned as the economy could not adjust well to externally driven disturbances when exchange rates and other prices were rigid. The controls inhibited the expansion of the economy. The first oil price hike of 1973 was one such external shock that had an adverse impact on the economy. Currency devaluation was the main instrument used to counter the negative effects of the drastic price changes.

The coffee boom of 1977 provided a favorable shock to the economy whose gains were however reversed by the negative impact of the second oil crisis of 1978. These shocks indicate the susceptibility of Kenya's economy to external factors. In the mid-70s to 1981 the deficits recorded in the current account increased by an average of about 12 percent in 4 years after the second oil price hike in comparison to 8 percent in 1975. Subsequently, macroeconomic policies were reviewed to address the unmanageable deficits in the external balance. The move from a fixed to a creeping peg exchange rate in the early 1990s marked the beginning of liberalization of Kenya's economy motivated by the structural adjustments programs in effect at the time.

The liberalization of the economy was further deepened in the 1990s with coverage on the goods and financial markets. By the year 1992, a dual exchange rate system with an 'official' exchange rate and a market rate was in operation. The market forces of demand and supply were gradually left to define domestic prices, interest rates and the exchange rate. The firm grip on controls was relaxed. However speculation in the foreign exchange market in 1993 threatened capital out flows and created unpredictability in exchange rate transactions particularly relating to importation on trade credits. This led to the devaluation of the official exchange rate three times. In the meantime, there was massive pressure being piled on domestic prices due to the increase in money supply during the electioneering process in 1992, financial scandals that involved some banks and exacerbated by the drought that was experienced in the same period. Import and foreign exchange licensing were thereafter scrapped in April 1993 and full retention accounts

presented Kenya adopted a floating exchange rate policy in the last quarter of 1993 and repealed the Exchange Control Act two years later.

Over time, floating exchange rates enhances the openness of the economy and promotes trade policies that are outward looking Similarly increased flexibility enhances the market forces of demand and supply which increasingly determine both the interest rates and exchange rates in the economy. As local economies open to international markets, the general rise in capital inflows experienced by emerging countries is attributed to the significantly enhanced growth of markets through exchange of productive capital and technology transfers that accompany the flows (IMF, 2000). A number of merits have been adduced in favor of floating exchange rates to a country that adopts the regime. First, the market forces of demand for and supply of foreign exchange is expected to permit progressive adjustment of the exchange rate. Second, changes in the nominal exchange rate would bring the demand for and supply for foreign exchange in to equilibrium. Third, the balance of payments effects would not be a consideration for the country as it can independently set the monetary policies to pursue Fourth, Fluctuations in the exchange would depict the position of external balances as opposed to reserve movements changing significantly.

1.3 The Research Problem

A flexible foreign exchange regime with occasional interventions to smooth out volatilities is a common practice in policymaking circles of many central banks, particularly in less developed countries in their efforts to stabilize the economy. The key challenge that besets such economies is the variations that occur making the local currency depart from a stable equilibrium position. Kenya's central bank embarked on a policy to enhance the stability of the exchange rate when the country changed to the flexible exchange rate regime from fixed rates. Interventions on the foreign exchange market by CBK have therefore aimed at minimizing the volatility of the exchange rate rather than securing any level of exchange rate. Factors emanating from both the domestic and international markets contribute to the frequent fluctuations in the exchange rate. To smoothen the harmful fluctuations the central bank periodically participates in the foreign exchange market through the sale and purchase of currencies. Developing economies, like Kenya

are susceptible to unique challenges arising from the effects of globalization. In an era of increased globalization and reliance on international trade, the role of trading currencies and their strength in foreign exchange markets is critical in the management of exchange rate policy and thus a concern for monetary authorities (see Nwafor, 2006 and Jimoh, 2004).

The economic crises such as the financial meltdown in the US and the Euro crisis which spread across countries with varying impacts, underpinned the need for deliberate efforts with regard to dealing with instabilities originating from the external macroeconomic environment. For instance, the Euro debt crises sparked speculation in the global foreign exchange markets with adverse effects on the stability of many currencies, the Kenya Shilling included. The depreciation of the Kenya shilling by 28.9 percent between January and October 2011 from Ksh 83.1 per US dollar in January 2011 to Ksh 107.02 per US dollar in October 2011 is attributed to such occurrences. The question therefore is how the monetary authorities respond to impulsive exchange rate fluctuations that represent misalignments that have detrimental implications on the allocations of resources and macroeconomic stability.

An understanding of the movements and the determinants of the exchange rate is paramount if monetary authorities are to design appropriate exchange rate policies and/or measures to address the shocks. Various approaches have been discussed extensively (see for example Jimoh, 2004; Nwafor, 2006; and Francis et al, 2001) in the analysis of exchange rates. The approaches are the Income, Absorption and Policy approaches categorized as traditional approaches and the Monetary Approach. Though the monetary approach has widely been applied in analyzing floating exchange rates in developed countries, literature on its use in developing countries is scanty; in fact its significance is yet to be fully exposed. This study therefore attempts to establish the relevance of the monetary approach to exchange rate determination in Kenya as one of the developing nations.

This study focused on the relevance of the monetary approach to the determination of the nominal exchange rate between the Kenya shilling exchange and the US dollar. The choice of this exchange rate was motivated by the fact that over 60 percent of Kenya's trade with the rest of the world is in US dollars. Further about 65 percent of the country's official foreign exchange

reserves are in US dollars with the rest held in smaller proportions between Sterling Pound and the Euro (CBK, 2011). This study was therefore limited to the economic relationship between Kenya and USA

1.4 Objectives of the Study

The overall objective of this paper is to examine the relevance of the monetary approach to floating exchange rate regime operable in Kenya since 1993. Specifically, the objectives of the paper are:

a. Determine the impact of money supply on the Ksh/USD exchange rate;

b. Assess the causal relationship between the exchange rate and money supply,

c. Based on the results in (a) and (b) above to draw policy implications and conclusions with suggestions for further research.

1.5 Significance of the Study

The contribution of the external sector to the performance of any economy cannot be over emphasized. In the case of Kenya which is a small and open economy the foreign sector in terms of imports and exports accounted for about 35% of GDP in the first five months of 2012.The external balance problem therefore reflects the country's economic performance. Granted this position the choice and appropriateness of a flexible exchange rate regime is a major attraction to policy makers, scholars, researchers, and country leaders among other stakeholders. Understandably, this is driven by the desire of every economy to achieve stable exchange rates since volatile rates portend instability in the entire economic structure of the country.

Since the adoption of the flexible exchange rates Kenya has faced several bouts of exchange rate instabilities that have adverse effects on economic development While economists generally agree that a major cause of the exchange rate variations following the oil price crises in late 1970s was adverse developments in the international economy mainly associated with the OPEC

oil price hikes, there is less agreement on the extent to which the fluctuations in exchange rates were caused by too expansionary fiscal and monetary policies pursued by the domestic policy-makers (Mwega and Ngola, 1988)). These have provided the impetus to analyze the extent to which external balance disequilibria arise out of monetary factors largely within the control of domestic policy makers.

The results of this study will therefore be of great interest to policy makers in the country, investors, development partners and students of open economy macroeconomics The findings will also contribute to the existing literature and further the research on monetary policy and trade and development in Kenya

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter reviews the theoretical literature as well as the empirical literature on previous studies by different scholars on the monetary approach to exchange rates. The literature reviewed is in line with the study area. The sources of the literature included books, periodicals, journal articles and unpublished papers among others. The aim of the review was to gain some understanding on how past studies on the monetary approach related to this study. Particularly the review looked at the similarities and differences in approaches, findings and methodologies, inadequacies of evidence, apparent contradictions or inconclusive evidence or unsatisfactory methods of analysis between the reviewed literature and this study

2.2 Theoretical Literature.

The origins of the exchange rate determination models have their roots in the traditional approaches to the balance of payments. A common feature of the traditional approaches to the BOP is the general belief in the ability of exchange rate and price changes to effect a change in relative prices and the BOP.

The monetary approach to balance of payments stresses that the money supply and demand are strong forces in determining a country's external position as indicated by the change in the country's foreign currency reserves. Basically the approach asserts that instability in the money market is reflected in the disequilibrium of the balance of payments. This means that from a

balanced position an increase in demand for money (or an increase in its supply) will lead to balance of payments deficit (or vice versa) which would be manifested in changes in the exchange rate.

The key assumptions of the model are:

1. There is a stable money demand function.
2. Prices are flexible and markets operate perfectly, so that there is always full employment and thus a given level of output
3. Purchasing Power Parity (PPP) holds.

Johnson (1977), proposed a formal monetary approach to BOP that gives money supply identity, money demand function and equilibrium condition. The money supply (M) is determined by the availability of international reserves (R) and level of domestic credit (DC) created by country's monetary reserves whereas real income (Y), inflation rate (P) and interest rate (r) are the determinants of money demand (Md). The equations that form the model include:

$$Ms = (R+DC) = M \quad \ldots\ldots (1)$$

$$Md = f(Y, P, r) \quad \ldots\ldots (2)$$

At equilibrium;

$$Ms = M = Md \quad \ldots\ldots (3)$$

Using the equations above and differencing, the basic monetary approach to BOP equation is be derived as:

$$\Delta R = \Delta[L(Y, Pd, r)] - \Delta DC \quad \ldots\ldots (4)$$

The determinants of exchange rate can be given in different models namely; the Keynesian multiplier or income approach, the monetary approach, the policy approach and the absorption approach. When the factors that determine money supply or money demand play an obvious role in exchange rate determination the theory is named the monetary approach to exchange rate determination. There are two principles that form the basis of this monetary approach to exchange rate determination, which include the quantity theory of money and the Purchasing power parity theory (PPPT) which influences how exchange rates and monetary factors interact.

In a fixed exchange rate regime, equation (4) is the monetary model used to determine the balance of payments position in a country. When exchange rates are flexible, external imbalances are manifested not through changes in the foreign reserves but rather through exchange rates. Based on this, Frenkel (1978) developed the flexible price monetary model given as:

$$\text{Ln}e = \log M - \log M^* + n^* \log y^* - n \log y + h(i - i^*) + u \quad \ldots\ldots (5)$$

Where e = the spot nominal exchange rate,

M = the domestic money supply,

Y = the domestic income,

I = the domestic interest rate

u = the error term

The corresponding foreign variables of the above set of variables are denoted by (*).

Foreign Exchange market is a monetary business where money in one currency buys money in another currency, and because of that, much consideration is given to it when determining the monetary approach to exchange rate. In this approach, exchange rate can be foretold using relative changes in money supply and real money demand, with the equilibrium between money demand and money supply signaling movements in the currency value. The key focus in the monetary approach to exchange rate determination theory is on the demand for money and its determinants as money supply is controlled by the monetary authorities (hence taken as a given). Therefore in a flexible exchange rate regime, movements in the value of currency primarily equilibrate money demand and money supply.

In general, the monetary approach model provides that the determinants of exchange rate is the interaction of relative supply of money and the relative real demand for money denoted [L(Y, P, r)] with the changes in interest rates, income and foreign prices occurring as a result of their influences on the money demand. A permanent increase in the domestic money supply causes a proportional increase in the price level under PPP, $e = \frac{P_d}{P_*}$ meaning that an increase in domestic money supply causes a depreciation of local currency against foreign currency. An increase in interest rates reduces the real domestic money demand, increases the domestic price levels and local currency depreciation in proportion to price change. Under PPP an increase in income levels raises the real money demand and subsequent fall in domestic price levels and appreciation of domestic currency. Increase on foreign prices has the same effects as those of interest rate

2.3 Empirical Literature

During the hyper-inflationary period after World War I (between 1920 and 1923), Frenkel (1978) studied the Monetary Approach for exchange rate determination in Germany. He used the natural logarithms of variables technique with the following variables; money supply and inflationary expectations to determine the behavior of the German exchange rate. The results showed that the exchange rate depreciated virtually proportionately with the money supply where the coefficients of the variables were found to be statistically significant with values of +0.975 and +0.591 for the coefficients of money supply and inflation pressure, respectively. These results were consistent with the monetary approach. Frenkel's test confirmed the relevance of the monetary approach to exchange rate determination in Germany..

A study that covered five countries (Canada, France, Japan, The UK and the US) as a group against West Germany as the foreign country was conducted by Dornbusch (1976) to test the monetary approach in a non- hyper inflationary period 1973 – 1979. During this time there was high inflation by developed countries' standards and increased adoption of flexible exchange rate policies in these countries.. The results from the study did not fully provide support for the applicability of the monetary approach for explaining exchange rate movements. Crespo-Cuaresma et al (2004) found the model to give a relatively useful explanation of the behavior of nominal exchange rates in a panel of six central and eastern European countries between 1994 and 2002. Similarly Wilson 2009 in his study of the US and its trade partners validated the monetary approach to exchange rate determination in the long term

Some other studies have been done on MAER and they quite provide support for the monetary approach to exchange rate determination. Providing evidence. Francis et al (2001) showed that the monetary model was in favor of PPP for the US and Canadian dollar during the period of 1984-1993.Upadhyaya et al (2006), using the data for G7 countries in the 1990s, tested the monetary model and provided support to the monetary approach to exchange rate determination though partially. The countries involved in the study where Canada, France, Italy, Japan and the US as a foreign country. The support was partial because the results of the study showed that the coefficients of some variables for different countries were consistent with monetary approach while some did not. In Zimbabwe, using multivariate cointegration and correction modeling, Dhiliwayo (1996) examined the role of money supply as a disturbance in the test of monetary approach to Zimbabwe's BOP. The finding shows that money was influential in determining the BOP establishing a one- to- one negative relationship and a strong link between domestic credit and the flow of international reserves.

In his study Tallam (1992) used a monetary model developed within the modern quantity theory tradition to test the relevance of the monetary approach to the balance of payments adjustments using a framework test analysis, the exchange market pressure model on Kenya's experience during the period1967-1990. The model is estimated using ordinary least squares technique and used annual time series secondary data. The findings of the study revealed that the model was satisfactory and supports the thesis of the monetary approach. The model was found to trace the turning points of the exchange market pressure satisfactorily, indicating the model to be valid. The results support the findings of Grubel and Ryan (1979) The study found monetary factors to be significant in explaining the exchange market pressure, implying the possibility of conducting

stabilization policies through better management of the country's monetary affairs blaming the persistent payments imbalances largely on the excessive expansionary monetary policy. They argue that the approach stresses powerful monetary linkages between countries and particularly the effects that money creation in other countries has on the domestic money supply in Kenya when exchange rates are fixed

In the monetary and exchange rate policy in Kenya, (Ndungu, 1999) affirms the relationship between monetary factors and the real exchange rate (Ndungu, 1997). Excess domestic credit or money supply surplus was found to feed in to movements of the real exchange rate. In addition two-way causation was established between real exchange rate and excess money growth. This shows that monetary shocks affect the real exchange rate. This was done using vector error correction methodology and data for the period 1970-1993. The Nigerian cross section study (Odedukun, 1997) indicated that the Nigerian balance of payments relies on monetary approach. This was done using monthly data between October 1986 and June 1991 for Nigeria against the OECD countries who takes up 91% of total Nigerian Imports

Excess supply of domestic credit and the growth in nominal exchange rate are short run determinants of real effective exchange rate (Munule, 2004). Through the application of PPPs tests, impulse response and variance decomposition functions, the study further finds the real fundamentals of price differentials and real shocks as key determinants of exchange rates in Zambia. Kombe used quarterly data covering a twenty five year period.

The analysis of the deutsche Mark/US dollar exchange rate adduces evidence of cointegration between exchange rates, relative money supplies, relative income and relative interest rates (IMF 1992) which gives testimony to the flexi-price monetary model. This is in concurrence with Edwards (1983) who found the model appropriate and a useful benchmark for the analysis of the behavior of floating exchange rates in developing economies. Monetary factors are the main source of exchange rate volatility (Khan et al, 2011). The Pak-Rupee exchange rate against the dollar analysis based on quarterly data for Pakistan was indicted a fitting the model

Both the quarterly and monthly data for Nigeria between 1987 and 2001was examined to determine whether they provided any support for the monetary approach to explaining exchange rate behaviors, and proven true, Jimoh (2004). Their recommendation was that monetary authorities should focus on domestic credit creation if Nigeria was to achieve any commendable level in her exchange rate. The naira-dollar exchange rate was also examined from 1986 to 2002 in order to examine the flexible price monetary model of exchange rate and its consistency with the variability of the exchange rate, finding an equilibrium relationship between the two (Nwafor, 2006).

Ghanaian cedi-dollar exchange rates was also used, establishing relative income and money supply as key variables considered in the exchange rate management and that the relative income influences money supply and money supply influencing the rate of interest and the exchange rate (Acheampong, 2007). Adamu et al (2009) validated the monetary model in their examination of panel data for the West African countries of Ghana, Guinea, Gambia, Nigeria, Sierra Leone and Liberia.

2.4 Overview of the Literature

This section provides a summary of the studies reviewed, in the empirical literature indicating those that have supportive evidence more so on the flexi-price monetary model and those whose findings have only provided partial support or none on the soundness of the monetary approach to exchange rate determination empirically. The differences in results are attributed to the time period when the studies where undertaken and the currencies in question Frenkel (1978) study based on the 1920s data and Lothian et al (2000) paper using monthly data for the period 1984-1993 provides support to the monetary approach theory. Both Upadhyaya (2006) using quarterly data for G7 countries; Japan, UK, France, Canada, US, Germany and Italy in the 1990s and Dornbusch's study covering five countries of Canada, France, Japan, UK and US against West Germany with data for 1973 – 1979 find mixed results on the validity of the model as some variables exhibited the appropriate signs while others did not

In sub Saharan Africa studies on the monetary approach to exchange rate determination Odedukun (1997), Jimoh (2004) and Nwafor (2006) supported the relevance of the monetary approach model on data from Nigeria. Cross sectional monthly data for the period 1986 – 1991 was used by Odedukun whereas Jimoh used both monthly and quarterly data from 1987 to 2001. Studies reviewed on the Kenyan experience such as by Tallam (1992) and Ondari (1995) were mainly done during the fixed exchange rate regime and gave credence to the monetary approach to balance of payments. Similarly, Chabeli (2002) and Dhliwayo (1996) studied the relevance of the monetary approach to exchange rate determination in relation to Zimbawe and Lesotho and both supported the theory.

In testing for the relevance of monetary approach to exchange rate determination most studies such as those by Frenkel (1978), Edwards (1983), Odedukun (1997), Jimoh (2004) and Nwafor (2006) used the two principles that form the basis of this approach to exchange rate determination, which include: the quantity theory of money and the Purchasing power parity theory (PPPT). Studies on Kenya done by both Tallam(1992) and Ondari(1997) were based on the fixed exchange rate regime. Whereas both studies used quarterly data for their analysis the gross domestic product values were derived from annual data since quarterly data was not available then. This paper looks at the relevance of the monetary approach since adoption of the floating rate in 1993 and takes advantage of the availability of data on quarterly basis from 2000.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter outlines the theoretical underpinnings of the monetary model, the data used and estimation techniques that were employed by the study to estimate the relevance of the monetary approach to exchange rate determination in Kenya From the discussions in the previous chapter, it is clear that the major building blocks of the monetary approach to exchange rate determination are the Purchasing Power Parity Theory (PPPT) and money market equilibrium conditions.

3.2 Theoretical Framework and the Monetary Model

The monetary approach to exchange rates determination is based on the law of one price under PPPT and quantity theory of money. The PPPT states that when the exchange rate is in equilibrium, it is equal to ratio of the domestic prices to the foreign prices This implies that the exchange rate is maintained at a stable position when changes in domestic prices meet comparative changes in foreign prices. The PPPT is represented as:

Nominal Exchange Rate = Local price level (Pf)/ Foreign Price level (Pl).

The quantity theory of money on the other hand says that equilibrium balance occurs in the money market when the money available in the market is the same as the money demanded.

Money supply is an exogenous factor determined by the monetary authorities, while the demand for money is influenced by the reasons to hold money given as speculative, transactionary and precautionary motives. The factors that affect money demand are the real income, interest rates, prices, and real money balances.

From the above discussion, we then derive the monetary approach model using the purchasing power parity theory and the money market equilibrium condition. We follow the approach adopted by Odedukun (1997), Jimoh (2004) and Nwafor (2006) in studying the relevance of this approach to exchange rate determination in Nigeria using both monthly and quarterly data.

The variables that are used include:

Y = domestic real income;

P = domestic prices;

e = exchange rate;

r = interest rates;

L = demand function for real cash balances in the domestic economy.

(*) variables are the foreign counterparts of the domestic ones.

The PPP theory equation (as represented above) is given as:

$$e = \frac{P_d}{P_*} \quad \ldots\ldots (6)$$

Domestic money supply M^s and real money demand M^d denoted, respectively by

$$M^s = M^d \quad \ldots\ldots (7a)$$

$$M^d = L(y, r, k) \quad \ldots\ldots (7b)$$

Similarly, the foreign nominal money supply M^{s*} and real money demand M^{d*} denoted by

$$M^{s*} = M^{*} \quad \text{(8a)}$$

$$M^{d*} = L^{*}(y^{*}, r^{*}, k^{*}) \quad \text{(8b)}$$

The money market equilibrium in both domestic and foreign money markets therefore implies that:

$$\frac{M}{P} = M^{d} \quad \text{(9a)}$$

$$\frac{M^{*}}{P^{*}} = M^{d*} \quad \text{(9b)}$$

From equations (6) and (9a and b):

$$e = \left[\frac{M}{M^{d}}\right] / \left[\frac{M^{*}}{M^{d*}}\right] \quad \text{(10a)}$$

$$e = \left[\frac{M}{M^{*}}\right] \left[\frac{L^{*}(y^{*}, r^{*}, k^{*})}{L(y, r, k)}\right] \quad \text{(10b)}$$

For PPPT to hold, the income elasticity and interest rate elasticity of demand for real money balances should be assumed equal in both the domestic and foreign country. Suppose the functional form for the money demand represents the Cobb-Douglas function, then,

$$L(y, r, k) = K y^{a} r^{b} \quad \text{(11a)}$$

And

$$L^*(y^*, r^*, k^*) = K^* y^{*a} r^{*b} \quad \text{..... (11b)}$$

Equation (14b) then becomes

$$e = \left[\frac{M}{M^*}\right]\left[\frac{K^* y^{*a} r^{*b}}{K y^a r^b}\right] \quad \text{..... (12a)}$$

Or

$$e = \left[\frac{K^*}{K}\right]\left[\frac{M}{M^*}\right]\left[\frac{y^{*a}}{y^a}\right]\left[\frac{r^{*b}}{r^b}\right] \quad \text{..... (12b)}$$

To establish a linear relationship for ease of estimation, we convert equation 12b into logarithms, as follows:

$$lne = ln\left[\frac{k}{k^*}\right] + a_1 ln\left[\frac{M}{M^*}\right] + a_2 ln\left[\frac{y}{y^*}\right] + a_3 ln\left[\frac{r}{r^*}\right] \quad \text{..... (13)}$$

Table 3.1 below shows the signs of the coefficients of the variables for the monetary approach to exchange rate theory to be true.

Table 3.1: Expected signs of the coefficients of the variables

Variable	Coefficient	Expected sign
The money supply ratio	a_1	> 0 *
The output ratio	a_2	< 0
The Treasury bill ratio	a_3	> 0

* must be close to or equal to unity (1).

But the traditional approaches require that $a_3 < 0$ since an improved domestic rate of return on investment would attract capital inflows and support an appreciation of the exchange rate.

Equation (13) tests the relevance of the monetary approach to exchange rate determination assuming PPPT and equilibrium money conditions hold. In this regard, the study assumes that that income elasticity 'a' and interest rate elasticity 'b' of the demand for real money are the same in Kenya and US. This assumption is necessary for PPPT to hold in the specification shown in equation 12a. Variations in the elasticities would imply that the exchange rate cannot be predicted squarely on the basis of changes in income and interest rates, and thus the achievement of purchasing power parity conditions would not be possible. For the estimation results of this study to provide evidence in favour of the monetary approach, the parameter a_1 point estimate must be statistically not different from unity (1). In this regard, the coefficient estimate for the ratio of money balances a_1 must be close to or equal to unity (1). If this is not the case, there is no strong evidence for the determination of exchange rate through the monetary approach.

3.3 Data Sources

The study used secondary data. Quarterly data from 2000.Q1 to 2012:Q1 on Kenya shilling exchange rate versus the US dollar, real Gross Domestic Product, measures of broad money stocks, and measures of interest rate (Treasury bill rates) for both Kenya and the USA was utilized in the research. The respective country data were obtained from the International Financial Statistics book volumes. The exchange rate used is Kenya Shilling per US dollar end period rate. For Kenya, the study used the measure of broad money, M3 while for the USA; M2 was used as the comparable broad money measure. The Income measure is the real GDP while the interest rate measure is the 91-day Treasury bill rate.

CHAPTER FOUR

4.0 DATA ANALYSIS AND EMPIRICAL RESULTS

4.1 Introduction

This chapter provides some descriptive statistics of the data and results of estimation of the model specified in Chapter three. Further, estimation results are also interpreted on the basis of expectations and theoretical foundations. Testing for the relevance of the monetary approach to exchange rate determination in Kenya requires an estimation of equation 13, with a particular interest in the value of a_1 . But before this was done, the data was described in terms of correlations, causality to indicate the direction of influence between the variables, and stationarity tests done to establish the order of integration of the variables of interest.

4.2 Descriptive statistics of the Data

Table 4.1 below shows the summary descriptive statistics of the data used in the study as defined in the data requirements section of the previous chapter. The data indicates that the exchange rate averaged Ksh 76.68 per US dollar and oscillated between Ksh. 99.83 and Ksh 77.34 per US dollar over the sample period (2000:Q1 to 2012:Q1 or 49 observations) with a standard deviation of 6.37. Overall Kenya's money stock and GDP is on average 13 percent and 12 percent of the US total money stock (M2) and GDP, respectively (both converted using the current end of period exchange rate). But the Treasury bill rate in Kenya is on average 65 times higher than that of the USA. Generally, the data indicates that over the sample period, the ratio

between Kenya's Treasury bill rate and the US Treasury bill rate has the highest volatility (as measured by the standard deviation from the mean) followed by the exchange rate, then the money supply ratio and lastly the GDP ratio. The rest of the statistics are as shown in Table 4.1 below.

Table 4.1: Summary Descriptive Statistics of the Data

	KSH/USD	Kenya M3/ USA M2 %	Kenya GDP/USA GDP %	Kenya Tbill rate/ USA Tbill rate
Mean	76.68	0.13	0.12	65.68
Median	77.34	0.12	0.11	3.65
Maximum	99.83	0.19	0.14	1193.00
Minimum	62.68	0.09	0.10	0.88
Std. Dev	6.37	0.03	0.01	214.76
Observations	49	49	49	49

Source International Financial Statistics (IMF)

4.3 Correlation Test Results

High correlations between variables in a model can distort the results of the estimation by indicating very high t-statistics, very strong adjusted R-squared and unexpected signs on the coefficients. In this regard, it was necessary to check the correlation measures between the variables specified in equation 13 before estimation of the model The correlations test results indicate that there is no significant correlation between money ratio (Kenya M3/ USA M2) and the exchange rate (correlation measure of 0.0476).However, there is a significant negative correlation between the KSH/USD exchange rate and the output ratio (Kenya GDP/ USA GDP)

as depicted by the correlation of -0.6630.Similarly, there is a significant positive correlation between the exchange rate and the interest rates ratio (Kenya 91-day Treasury bill rate/USA 91-day Treasury bill rate), as shown by the correlation measure of 0.6130. In addition, there exists a significant positive correlation between money ratio and output ratio (0.6374), as shown in Table 2 below. Generally, correlations measures greater than 0.5 (like between GDPRATIO and MONEYRATIO, and between the EXCHRATE and GDPRATIO) indicate strong relationships between the variables and provide evidence for presence multicollinearity. This means that there is need to consider estimation approaches that minimize multicollinearity of variables (for instance, the Generalized Method of Moments) to avoid arriving at coefficients with unexpected signs.

Table 4.2: Correlation Matrix

	KSH/USD	Kenya M3/ USA M2 %	Kenya GDP/USA GDP %	Kenya Tbill rate/ USA Tbill rate
KSH/USD	1.0000			
Kenya M3/ USA M2 %	0.0476	1.0000		
Kenya GDP/USA GDP %	-0.6630	0.6374	1.0000	
Kenya Tbill rate/ USA Tbill rate	0.6103	0.3967	-0.1707	1.0000

4.4 Causality Tests

The objective of this test is to establish the direction of influence between the variables of interest in this study. The study used an approach proposed by Granger (1969) to conduct this test applying the statistical software: *Eviews*. The difference between this test and the correlation test is that the correlation test indicates the relationship between variables but does not show the direction of influence. Thus, it is important to conduct this test to establish whether, for example, the exchange rate over the sample period influenced the conduct of monetary policy (by influencing the quantity of money in circulation) or *vice versa*. The test runs a null hypothesis test that:

Variable x does not granger-cause variable y in the first regression and that Variable y does not granger-cause variable x in the second regression

Based on the F-statistics automatically generated by Eviews and the reported probabilities (of *committing an Error if you reject the hypothesis*), conclusions are drawn using the statistically accepted maximum threshold of 10 percent level of significance (the lower the level of significance, the stronger the stance of rejecting the null- hypothesis). The results of the Granger causality test conducted on the variables are presented in Table 4.3 below.

Table 4.3: Granger Causality Test Results

Null Hypothesis	Obs	F-Statistic	Prob
MONEYRATIO does not Granger Cause EXCHRATE	47	3.99916	0.025*
EXCHRATE does not Granger Cause MONEYRATIO		5.95358	0.0053
OUTPUTRATIO does not Granger Cause EXCHRATE	47	6.95244	0.0025
EXCHRATE does not Granger Cause OUTPUTRATIO		5.39568	0.0082
TBILLRATIO does not Granger Cause EXCHRATE	47	5.643*	0.006*
EXCHRATE does not Granger Cause TBILLRATIO		4.55*1	0.0162
OUTPUTRATIO does not Granger Cause MONEYRATIO	47	2.55319	0.0899
MONEYRATIO does not Granger Cause OUTPUTRATIO		0.*4461	0.4811
TBILLRATIO does not Granger Cause MONEYRATIO	47	*.08941	0.0022
MONEYRATIO does not Granger Cause TBILLRATIO		5.12519	0.0102
TBILLRATIO does not Granger Cause OUTPUTRATIO	47	6.03023	0.005
OUTPUTRATIO does not Granger Cause TBILLRATIO		2.31392	0.1113

Note: The F-statistic reported in the regression output is from a test of the hypothesis that all of the slope coefficients (excluding the constant, or intercept) in a regression are zero. The higher the F-statistic the stronger the case for a rejection of the null hypothesis.

From the results above, and focusing on the primary interest of the study, i.e. the relationship between money supply and exchange rate movements, it is clear that at 5% level of significance there seems to be dual-directional causation between *MONEYRATIO and EXCHRATE. However, at 1 % level of significance (or with 99% confidence),* the null hypothesis of *Exchange rate (EXCHRATE) does not granger-cause money ratio (MONEYRATIO)* can be rejected (without committing an error. This is because the probability that a rejection of the Null hypothesis is less than 1% (it is equal to 0.0053 as shown in Table 4.3). Using the same thresholds, we cannot reject the null hypothesis that MONEYRATIO does not Granger-Cause EXCHRATE. This implies the changes in MONEYRATIO have an influence on the EXCHRATE and the direction

of influence is strongly from money supply to exchange rate, and not the reverse. This forms initial evidence for support of the monetary approach to exchange rate determination in Kenya. However, there is the need to establish the empirical relationship between changes in money supply and the exchange rate by establishing the estimate for the coefficient 'a_1'

4.5 Tests for Stationarity of Variables: Unit Root Tests

Before estimation, all the variables were subjected to unit root tests to ascertain their stationarity conditions to avoid arriving at non-sensible regression results. Stationarity of a variable implies that the mean, the variance and covariance of the variable is time invariant (have a constant mean and variance overtime). If non-stationary variables are included in an estimation process, the results obtained will be spurious or non-sensible with theoretical inconsistencies and hence cannot be used to inform policy recommendations.

At first glance, the graphical trends on the variables in *Appendix I* shows that before statistically determining the stationarity conditions of the variables, it can be deduced that the variables are non-stationary. However, there is need to empirically test for stationary to ascertain whether the variables are stationary or not. Statistically, this is popularly done in literature using the Augmented Dickey-Fuller approach (Fuller *et al.*, 1981). The test assumes that the variable is an autoregressive (AR) process derived from the following specification:

Assume variable y has an AR process specified as:

$y_t = \alpha y_{t-1} + \varepsilon_t$.

Subtracting y_t from both sides of the equation yields:

$\Delta y_t = (\alpha - 1) y_{t-1} + \varepsilon_t$

The Augmented Dickey-Fuller tests performs a hypothesis test that $(\alpha - 1) = 0$ or $\alpha = 1$. When this hypothesis is accepted it means the series reverts to its long term mean and does not explode when there is a shock. This is the essence of the test for stationarity of a time series variable.

When a variable is not stationary at its levels, it is differenced (by obtaining changes between current levels and lagged level) then the same test is conducted on the differenced series. If the series is stationary after differencing once, then the variable is said to be stationary after 1st difference, or is integrated of order 1, denoted as I(1). If stationary after the 2nd difference (that is say $y_{t-1} - y_{t-2}$, then the variable is said to be an I(2). In essence, the order of integration implies the number of times that the variable needs to be differenced (obtain changes overtime) before it becomes stationary. A variable stationary at levels (without differencing) is therefore referred to as an I(0) process.

Table 4.4 below shows the results of ADF test performed on the variables. The results indicate that all the variables are integrated of order 1 (implying they are stationary after first difference) except the ratio of domestic Treasury bill rate to the US Treasury bill rate which is integrated of order zero (I(0)- meaning stationary at levels.

Table 4.4: Unit Root Test Results

Variable	ADF Test Results		Conclusion on the order of integration
	Levels	First Differences	
Exchange Rate	*Non-stationary*	-6.6017***	I(1)
Kenya M3/ USA M2	*Non-stationary*	-5.6714***	I(1)
Kenya Tbill rate/ USA Tbill rate	*Non-stationary*	11.3723***	I(0)
Kenya GDP/ USA GDP	*Non-stationary*	-5.6460***	I(1)

Note ***, **, * *means significance at 1%, 5% and 10% respectively.*

Since the dependent variable (exchange rate) is an I(1) process, it is important to establish whether this variable has a long run relationship with the two other I(1) variables , for this case the MONEYRATIO and the OUTPUTRATIO. This implies a test for cointegration of these variables integrated of the same order Cointegration is a concept basically refers to the condition that even if individual series are non-stationary (like this case), if there exists a linear combination of the I(1) variables in the regression equation and this linear combination is stationary, then the regression including the (1) variables is not a spurious regression. From theory, a group of variables may be tied together by theory, or are cointegrated. This can be established by performing a cointegration test on the I(1) variables i.e. the exchange rate, the ratio of money supply measures and the ratio of outputs of the two countries.

4.6 Testing for Cointegration

In theory, there are two basic ways of testing for the existence of cointegration between variables: namely the Engle-Granger or EG approach (Engle and Granger, 1987), and the Johansen approach (Johansen and Juselius, 1990). Following the EG approach, two or more series are cointegrated of order d,b; and they are denoted as CI (d,b) if they are integrated of order d, but a linear combination of these variables exists that is integrated of order b, where $b<d$. This approach is sometimes referred to as a residual-based approach since it uses the residuals of the long-run equation (comprising of the variables integrated of the same order) to determine the state of cointegration.

In particular, if the residuals generated from the long run estimation are stationary, then the variables are cointegrated, and *vice versa*. We adopt the Engle- Granger approach because it is powerful when the theory relating the variables is clear, like the case in this study. In this regard we make an assumption about a unique cointegrating vector in the analysis (see Engle and Granger, 1987). The long-run equation with the I (1) variables is specified as:

$$lne = ln\left[\frac{k}{k^*}\right] + a_1 ln\left[\frac{M}{M^*}\right] + a_2 ln\left[\frac{y}{y^*}\right] + \varepsilon_t \quad \text{..... (14)}$$

The estimation results for equation 14 are posted as table 4.5 below.

Table 4.5: Long run Exchange Rate Model of I(1) Variables

Dependent Variable: LNEXCHRATE
Method: Least Squares
Sample: 2000Q1 2012Q1
Included observations: 49

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOUTPUTRATIO	-0.8145	0.0328	-24.8386	0.0000
LNMONEYRATIO	0.1728	0.0330	5.2340	0.0000

R-squared	0.656592	Mean dependent var	4.336282
Adjusted R-squared	0.649286	S.D. dependent var	0.082726
S.E. of regression	0.048991	Akaike info criterion	-3.15438
Sum squared resid	0.112808	Schwarz criterion	-3.07717
Log likelihood	79.28238	Hannan-Quinn criter.	-3.12509
Durbin-Watson stat	0.131834		

From these results, a residual series (resid01) was generated and subjected to unit root test (ADF) to establish its nature of stationarity. The ADF results are reported in table 4.6. Since the t-statistic computed from the ADF test is greater than the critical value at 10%, 5% or 1% level of significance; the null hypothesis that the *residual series (resid01) is not stationary* cannot be rejected. This implies that the series is not stationary and thus, there is no cointegration among

the I (1) variables. Having ruled out the possibility of cointegration, means we estimate equation 13 with the I(1) variables in their stationary conditions, i.e. in their 1st differences.

Table 4.6: Unit Root Test Results for Resid01

Null Hypothesis: RESID01 has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.981717	0.2877
Test critical values:	1% level	-2.614029	
	5% level	-1.947816	
	10% level	-1.612492	

*MacKinnon (1996) one-sided p-values.

4.7 Model Estimation Results

Based on the cointegration test results, table 4.5 and the results of the unit root test, table 4.4, we estimated a modified equation 13 (with variables in their stationary state) as follows:

$$D(lne_t) = c_0 + c_1 D(ln\frac{Y_t}{Y_t^*}) + c_2 ln\frac{tbill_t}{tbill_t^*} + c_3 D(ln\frac{M_t}{M_t^*}) + \epsilon_t \quad \ldots\ldots (16)$$

In this case D denotes the 1st difference of the respective variable. The estimation is carried out in Eviews using the Generalized Method of Moments (GMM) in order to reduce any form of multicollinearity in the macroeconomic set of variables used in this study (as evidenced from the high correlation between some variables). GMM is an instrumental variable approach that requires an identification of as many instruments as the number of independent variables in the estimation process. The variable should be correlated with the independent variables but not correlated with their error terms. In this case, the lagged values of the variables are the best instruments to be used in the estimation process. Table 4.7 shows the results of the estimation.

Table 4.7: Exchange Rate Model Estimation Results (Dependent variable: LNEXCHRATE)

Variable	Coefficient	Std. Error	t-Statistic	P-Value.
Constant	-0.9153	0.7755	-1.1803	0.2442
LOG(KENGDP)-LOG(USGDP)	-0.7772***	0.1611	-4.8255	0.0000
LOG(KENM3)-LOG(USM2)	0.0076	0.0643	0.1184	0.9063
LOG(KENTBILL)-LOG(USTBILL)	0.0315***	0.0051	6.1945	0.0000
Adjusted R-Squared	**0.858**			

*Note: ***, **, * means significance at 1%, 5% and 10% respectively.*

The robustness of the model is tested using its goodness of fit (by forecasting the model within-sample) and performing the normality test on its residuals. While a good fitting model establishes the power of the model to be used for forecasting, the normality test confirms the model is well specified and its errors would be well distributed in the model. This works to enhance the stability of the model.

Appendix 4 presents some diagnostic test results on the model depicting the graph showing how well the estimated model fits onto the actual data series. It can be deduced that the model closely represents the actual data and thus can be used for forecasting the exchange rate in Kenya. Normality test involves performing hypothesis test on the residuals with the null that the series is normally distributed against an alternative hypothesis that it is not normally distributed. From the normality test statistic (*Jarque-Bera*) of 1.2287 with a probability of committing an error if we reject the null hypothesis of 54.09 percent, we cannot reject the null, and conclude that the residuals obtained from the model estimated are normally distributed. In this regard, we move ahead and make interpretations of the coefficient of the model. As this is done, focus is kept on

the impact of money supply ratio on the exchange rate, which is the primary objective of this study.

4.8 Discussion of Results

The coefficients of the equation 16 whose results are reported above show the expected signs. The results show that the exchange rate is significantly determined by output ratio and treasury bills ratio (at 1 percent level of significance (or with 99 percent confidence). In particular, a 1 percent increase in the output ratio, *ceteris paribus*, leads to a 0.77 percent appreciation of the exchange rate. Similarly, a 1% increase in the ratio of domestic Treasury bill rate to USA Treasury bill rate would lead to a deprecation of the exchange rate by 0.03 percent. While this partially supports the evidence for the relevance of the monetary approach to exchange rate determination, we examine the impact of money supply ratio on the exchange rate.

The money supply ratio despite having the expected sign on its coefficient is not significant in determining the exchange rate in Kenya. The initial requirements for the relevance of monetary approach to exchange rate determination is that the coefficient for the ratio of domestic money supply to US money supply measures should be close to or equal to 1(statistically not different from 1). The results above indicate a coefficient of 0.0076 which is very small compared to 1.The empirical test results (Wald test) to establish if the coefficient of money supply ratio (C(3)) is statistically equal to 1 or not, indicate a rejection of the null hypothesis, that C(3)=1.This implies the coefficient of money supply ratio of 0.0076 is statistically different from zero. This confirms the irrelevance of the monetary approach to exchange rate determination in Kenya.

This means that the monetary policy approach to exchange rate determination theory is weak when cast on the Kenyan case using the US dollar –Kenya shilling pair of the exchange rate. These results are different from those found by Tallam (1992) and Ondari (1995) who found strong evidence of the relevance of monetary approach to exchange rate determination in Kenya. The difference in results could be attributed to the study periods since the two studies covered the period when the fixed exchange rate regime was operational. In addition, the period prior 1993 was characterized by exchange controls and during such periods, the Central Bank had limited independence to conduct monetary policy. In such a case, the foreign exchange reserves would vary considerably during periods of external shocks than the exchange rate fluctuating, hence the results.

CHAPTER 5

5.0 CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter makes a summary of the study, including key findings, conclusions with policy recommendations and areas for further study. The objective of the study was to examine the relevance of the monetary approach to floating exchange rates in Kenya using the Kenya shilling against the US dollar rate.

5.2 Summary and Conclusions

This paper aimed at testing the relevance of the monetary approach to exchange rate determination in Kenya. In particular, the paper was anchored on two theoretical underpinnings, the purchasing power parity theory and the money market equilibrium conditions. The study findings indicate that changes in ratio between Kenya's broad money supply to US broad money does not significantly affect the Ksh/USD nominal exchange rate. In essence, changes in money supply cannot be used to determine the long run exchange rate behavior. These results are contrary to experiences in other countries such as in Lothian et al (2000) for the Canadian dollar-U.S. dollar, Khan et al, 2011) for dollar-Mark and dollar-pound exchange rates, Chabeli (2002) for USD - Zimbabwean dollar exchange rate. The relevance of monetary approach to exchange rate determination in these countries is supported by the close similarity in the conduct of monetary policy in these countries. In addition, the results contrast those found by Tallam (1992) and Ondari (1997) who found strong evidence of the relevance of monetary approach to exchange rate determination in Kenya when they studied the fixed exchange rate regime.

5.3 Policy Recommendations, Study Limitations and Areas for Further Study

5. 3.1 Policy Recommendations

From the above findings, it is clear that changes in relative money supply between Kenya and the USA do not play a critical role in the determination of the KSH/USD exchange rate This implies that monetary policymakers in Kenya as they focus on conducting monetary policy directed at achieving stability of the exchange rate should not be driven by changes in money supply in the USA but rather by changes in other factors such as the relative performance of the two economies (OUTPUTRATIO) as well as the differential between the Treasury bill rates between the two countries. In particular, for the exchange rate to appreciate the ratio of domestic output to USA output should increase. Therefore policies to support increase in economic activity should be put in place. Similarly, the differential between Kenya's Treasury bill rate and the USA Treasury bill rate should be maintained at positive levels if the exchange rate were to remain stable. This is perhaps because when the domestic Treasury bill rate is higher than the foreign rate (implying higher relative rate return on investment in Kenya), this would attract capital inflows and reduce pressure on the exchange rate to depreciate

5. 3.2 Limitations of the Study

This study focused on the relevance of the monetary approach to the determination of the nominal exchange rate between the Kenya shilling and the US dollar. The choice of this exchange rate was motivated by the fact that over 60 percent of Kenya's trade with the rest of the world is in US dollars. Further about 65 percent of the country's official foreign exchange reserves are in US dollars with the rest held in smaller proportions between Sterling Pound and

the Euro (CBK, 2011). This study was therefore limited to the economic relationship between Kenya and USA. Further, the choice of study period was limited by availability of quarterly GDP data for Kenya only from 2000:Q1 onwards. This therefore limited the study period to the 1st quarter of 2000 to the 1st quarter of 2012.

5. 3.3. Areas for Further Research

This study focused on a two country (Kenya and USA) model in the determination of the exchange rate based on the monetary approach. Further research can be done using multi currencies and countries to cover Kenya's trading partners at various levels of economic development: less developed, developing and the developed economies. Similarly consideration should be made to use other measures of income (GDP) other than nominal values. In particular, we recommend the real effective exchange rate that reflects all trading currencies and their relative weights can be used together with other broad measures of monetary supply in global financial markets to test for the relevance of monetary approach to real exchange rate determination Focus could also be given to the relationship of the Kenya shilling to the currencies of the countries who share a common trading block such as the East Africa Community and the Common Market of Eastern and Southern Africa (COMESA)

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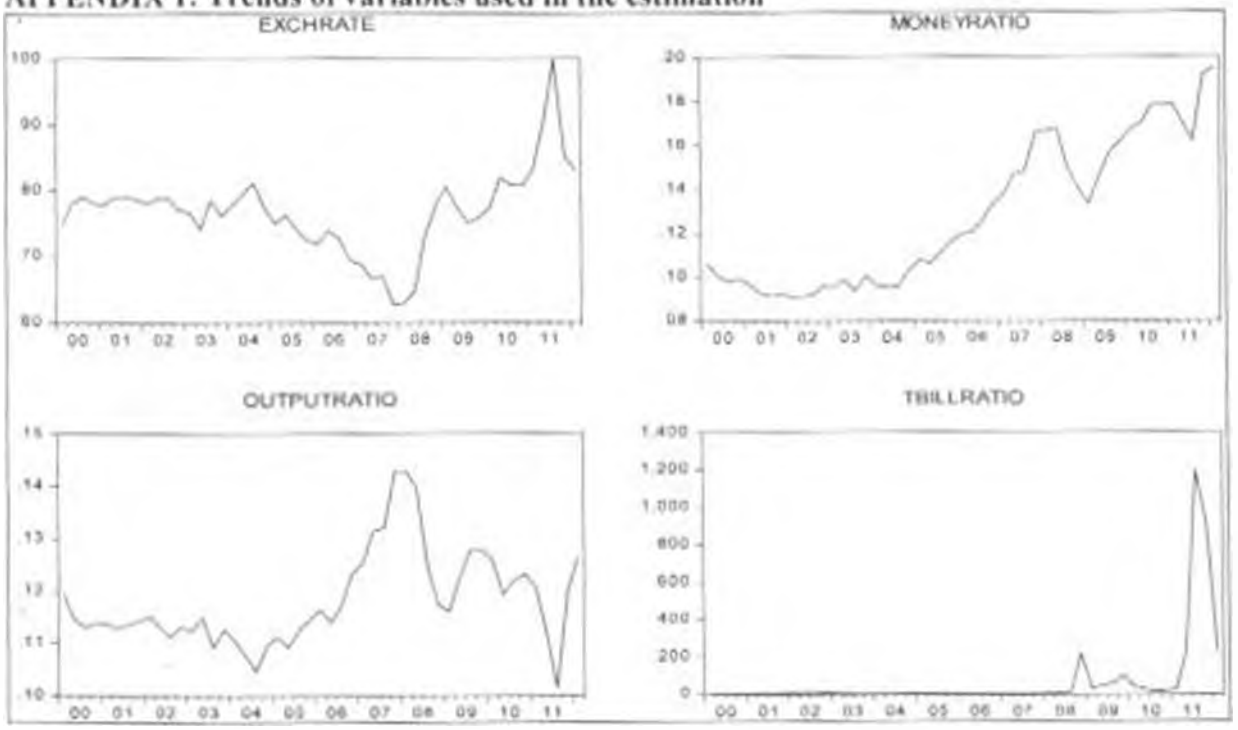
APPENDICES

APPENDIX 1: Trends of variables used in the estimation



APPENDIX 2: Long run Exchange Rate Model of I(1) Variables

Dependent Variable: LNEXCHRATE
Method: Least Squares
Sample: 2000Q1 2012Q1
Included observations: 49

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOUTPUTRATIO	-0.8145	0.0328	-24.8386	0.0000
LNMONEYRATIO	0.1728	0.0330	5.2340	0.0000

R-squared	0.656592	Mean dependent var	4.336282
Adjusted R-squared	0.649286	S.D. dependent var	0.082726
S.E. of regression	0.048991	Akaike info criterion	-3.15438
Sum squared resid	0.112808	Schwarz criterion	-3.07717
Log likelihood	79.28238	Hannan-Quinn criter.	-3.12509
Durbin-Watson stat	0.131834		

APPENDIX 3: Unit Root Test Results for Resid01

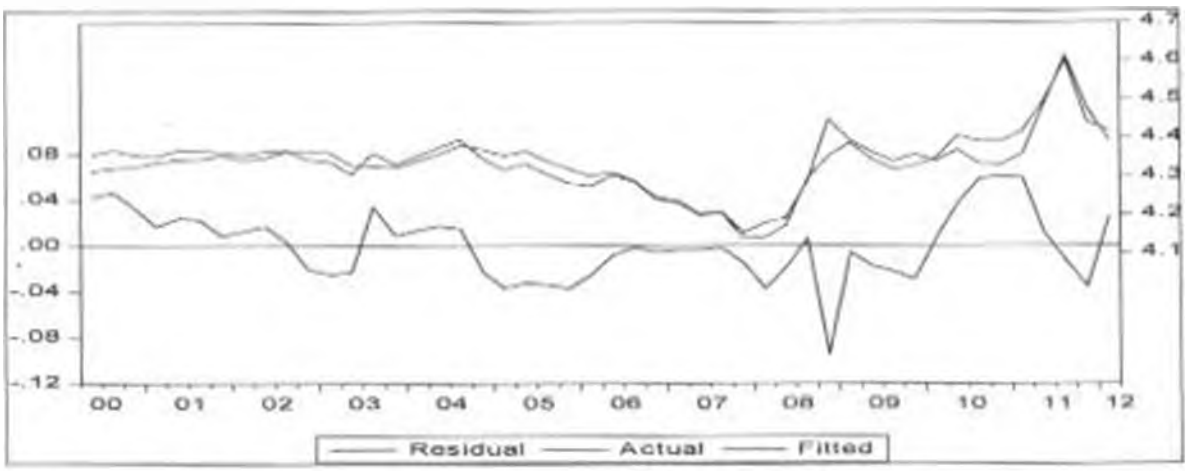
Null Hypothesis: RESID01 has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.981717	0.2877
Test critical values:	1% level	-2.614029	
	5% level	-1.947816	
	10% level	-1.612492	

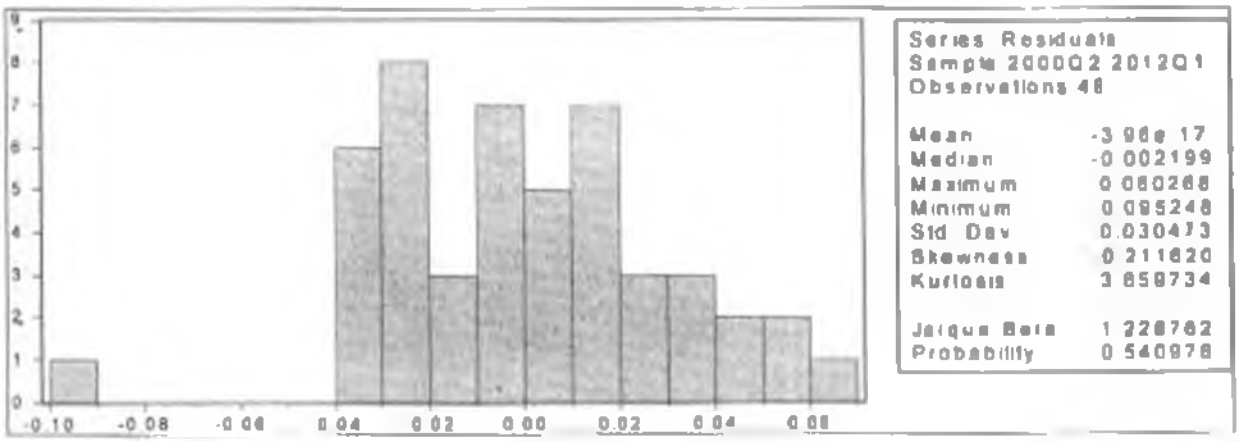
*MacKinnon (1996) one-sided p-values.

Appendix 4: Diagnostic tests for the Estimated Model (of Equation (13))

A. Goodness of Fit:



B. Normality Test:



APPENDIX IV: Wald Test on the coefficient of Money Supply Ratio

Test Statistic	Value	df	Probability
t-statistic	-15.42733	44	0.0000
F-statistic	238.0025	(1, 44)	0.0000
Chi-square	238.0025	1	0.0000
Null Hypothesis: C(3)=1			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
-1 + C(3)		-0.992381	0.064326
Restrictions are linear in coefficients.			