# THE RELATIONSHIP BETWEEN THE REAL INTEREST RATE AND THE REAL EXCHANGE RATE IN KENYA

**BY**

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# DECLARATION

I declare that this research project is my original work and has not been presented for award of any other degree at the University of Nairobi or any other university or institute.

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This research project has been submitted for examination with my approval as the University Supervisor.

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Date……

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## List of Abbreviations

CBK: Central Bank of Kenya

CBR: Central bank Rate

Exchange rate: In this study is represented by the Kenya Shilling price of a U.S Dollar

ECM: Error correction Model

DCC: Dynamic Correction Coefficient model

G7 Countries: Canada, France, Germany, Italy, Japan, United Kingdom, and the United States

GDP: Gross Domestic Product

IMF: International Monetary Fund

MPC: Monetary Policy Committee

P-Value: Alpha value

PPP: Purchasing power parity

RERI – Real exchange rate and real interest rate

U.S: United States

USD: US Dollar

VAR: Vector Autoregressive Specification

# ABSTRACT

The project analyses the relationship between the real interest rate and real exchange rate. The project focuses on the Kenya economy and captures the period 19971 to 2013. This covers the period of both fixed and floating exchange rate regime. The high-frequency data used in the project was deemed noisy, thus the model was re-estimated in a technique that uses time-varying parameters for comparison. Theoretically, it is argued that the interest rate differential will widen as the real exchange rate appreciates, and this triggers capital to flow in. Also, domestic inflation will rise as the real exchange rate depreciates, and the influence of foreign inflation will decrease as the exchange rate appreciates. The policy lessons that emanate from these results relate to exchange rate management and interest rate structure. One of the aspects of policy dilemma argued in the paper is that the real interest rate differential and the exchange rate absorb shocks from each other. The project findings shows that closing the gap in the real interest rate by lowering the domestic interest rate will be consistently result in depreciation of the exchange rate. Ideally, the approach is not to sterilize capital flows but to allow exchange rate movements to stabilize the flows in the medium to long term. In the end, the effects on the interest rate structure will be transitory. It is therefore advisable to avoid responding to short-term capital flows. With a floating exchange rate and an open capital account. Ignoring the short term capital flows will allow the exchange rate to equilibrate reserves and determine the optimal flow of short-term capital. The findings revealed that 45 percent of changes in real exchange rates is as a result of changes in real interest rates. The findings in the study also revealed that the F Value = 14.725and P-value at 0.01 is less than 0.05. This implies that indeed interest rates negatively affect the real exchange rates. This implies that indeed interest rates negatively affect the real exchange rates. The findings agree with some findings of studies done before, that movement of short-term capital is as a result of agents' perception of risk of domestic assets in the country and sometimes is as a result of reaction of stock adjustments to changes in prices or shocks or both. Policy intervention would distort the rates more and only lender the problem more complex.

# CHAPTER ONE

# INTRODUCTION

## 1.0 Background of the Study

The Kenya government adopted a new foreign exchange policy in 1993. This new policy involved changing from a flat exchange rate regime to a floating exchange rate regime. Exchange rate in Kenya has been volatile since 1994 except for some few times in 1997. According to Kisaka and Mwasaru (2012), floating exchange rate gives rise to two risks. First is a transaction exposure, this arises from losses and gains realized from investments transactions that are settled in foreign currency terms. Second is the economic exposure, which results from variation of discounted cash flow of a firm which is given by exchange rate fluctuations. This explains how firms and investors have increasingly had foreign exchange rate exposure with the new regime. Theoretically, a change in exchange rate results in a change in stock prices. This implies that investors face increased uncertainty of investment portfolio returns.

The liberalization experience in Kenya shows that the interest rate has been high even when our inflation rate has been low or declining. During the liberalization period, the economy of Kenya experienced short term capital flows that responded to the interest rate differential. Exchange rate volatility has adverse consequences in various aspects of the economy. This study aims to analyze the relationship between the Kenya real exchange rate and real interest rate. The study also seeks to explore the implications of the two rates on private capital flows. These capital flows are speculative portfolio flows. Kenya adopted conflicting objectives and goals in the management of exchange rate, which brought a lot of policy dilemma to the authorities and particularly the Central Bank of Kenya. Various research works have been documented in this

area and rising volatility in exchange rate has been identified as having negative consequences on the Kenya economy as well as in most other economies (Ndung'u, 2001). There are several studies that have recommended for intervention of the monetary authority in managing local currency fluctuations so as to arrive at desired inflation target. Real exchange rate is influenced by various domestic factors like government spending, real output, as well as external shocks that significantly affect exchange rate through trade. Real exchange rate has widespread economic implications and there is dire need to explore the determinants of its volatility, this has been a key agenda in most academic research works and in policy making.

As explained by Ongeri (2013), external borrowing, particularly by private commercial banks and firms is among the key factors responsible for the severity of the East Asian financial and currency crises during the late 1990s. In effort to provide an in-depth look at features of currency crises, Ndung'u (2001) came up with a model that suggests that the size of a country debt that is denominated in foreign currency explains the overshooting in exchange rate, stops in capital flows as well as general output drop in the domestic economy. Goldstein et al. (1991) explained the need to explore the variables that are relevant in understanding mutual exchange rate volatility in developing countries where volatility in their exchange rates is negatively affected by their external debt. Analyzing interest rates structure and its stochastic properties can give useful information regarding the effects of interest rate shocks and appropriate policy responses.

### 1.1.1 Interest Rate

According to a definition by World Bank, real interest rate refers to the lending interest rate that is adjusted of inflation as determined by GDP deflator. It is the rate expected by investor after inflation adjustment and can be explained well using Fisher's equation that explains real interest rate as rate arrived at by taking nominal interest rates and subtracting inflation rate. Real interest

rate includes the systematic and regulatory risk only and it gives the time value of money. In an economy, real interest rate is given by the rate of return on risk free assets like the Treasury Bills minus inflation index like the GDP deflator. As mentioned by Ndung'u (2001), interest rate plays an important role in key economic relationships in macroeconomics. Nominal interest rate is for instance linked to expected inflation. Interest rate is also crucial in understanding of saving and investment decisions and in asset price determination.

Section 36 (4) of the Central Bank of Kenya Act specifies that the Central Bank has the mandate to announce the lowest rate of interest that it charges on loans to banks. This rate is called th**e** Central Bank Rate (CBR) and it's the lowest acceptable interest rate in case of a Reverse Repo (when CBK wants to inject liquidity), on the other hand it is the highest rate of interest acceptable by CBK in case of a Vertical Repo (when CBK wants to withdraw liquidity)**.** The CBR is reviewed in terms of magnitude, movement and direction by the Monetary Policy Committee (MPC) before it's announced and this signals the monetary stance. CBR acts as the base in monetary policy operations and it is meant to enhance certainty and clarity in implementation of monetary policy. These rates are however nominal and they comprise of three risk factors namely; default, taxation and inflation.

### 1.1.2 Exchange Rate

Exchange rate refers to the rate at which a given currency can be exchanged for another. Central Bank of Kenya has the mandate to compile indicative foreign exchange rates on daily basis that can be used by the general public (Ndung'u, 1991). These rates are compiled from the averages of buying and selling rates for major participants in the foreign exchange market at the open of trade every day. The rates therefore provide a forex good indicator for any interested party on the value of the shilling on any particular day. Such rates are however, only indicative to forex

dealers including commercial bureaus and banks as well as individuals. Commercial bureaus and banks may therefore apply different rates in their daily transactions. Like any other free market, demand and supply of forex transactions influences the rates applied. High competition among dealers may result in reasonable or competitive margins in forex transactions. Forex bureaus cater for retail end in the forex transactions as per the license given to them. Bureaus therefore often provide favorable exchange rates to their customers compared to commercial banks in terms of cash rates but in terms of larger amounts where such amounts are done via telegraphic transfers, commercial banks provide finer rates. These rates are however nominal, real exchange rate is the actual exchange rate that investors are given in their transactions; it is the purchasing power of a given currency relative to another in the current prices and exchange rates.

### 1.1.3 Effect of Interest Rate on Exchange Rate

Real interest rate is applied in different economic theories to explain phenomena such as business cycle, capital flight and economic bubbles. As highlighted by Ndung'u (2000), high real interest rates reduce consumption and increases savings all other factors held constant. Conversely, low real rate of interest reduces demand in savings and increases investment and consumption. International capital follows the movement in real interest rates. Capital flows from markets offering low real rates of interest to markets that offer high real rates of interest. This triggers speculation in exchange rates, equities and estates.

Theoretically, where the series of interest rate is stationary, shocks affecting it give transitory effects, that disappear in the long run (Engel, 2011). On the other hand, Non-stationary series result in shocks whose effects are permanent requiring policy intervention for mean reversion to

occur. A positive shock to the risk adjusted interest rate differentials has a statistically significant and immediate increasing effect on net short term capital inflows. Conversely, the increasing effect starts reducing within a year beyond which the reducing effect is statistically significant. These results are suggestive of the volatile nature of short term capital flows in response to sudden changes in cross-border risk adjusted interest rate differentials and that there is potential for sudden short term capital reversals.

### 1.1.4 Interest Rates and Exchange Rates in Kenya

Kenya moved from fixed to a floating exchange rate policy in 1993. The last three decades have depicted a high volatility in exchange rate in Kenya. The country has a floating exchange rate as well as an open capital account. There are some benefits that floating exchange rates raise in an economy, these include allowing continuous adjustment of exchange rate, aligning it with demand and supply forces instead of adjusting reserves level. It also allows pursuit of monetary policy without being overly concerned of the balance of payment effects. With floating exchange rates, external shocks are reflected in the rates rather than in reserves (Engel, 2000). The challenge is that such benefits have hardly been realized in Kenya.

Interest rates were liberalized in 1991 after which the minimum saving rate in Kenya fell from 13.5% to 6.9% between 1990 and 1995 (Ngugi, 2001). At the same time the maximum lending rate was at the peak of 38.5% in 1993. This marked an unsuccessful financial reform due to the deteriorating economic conditions and increased inflationary pressure that marked the period. The Kenya Monetary policy faced challenges after liberalization of exchange rate in 1993, which marked loos for CBK in terms of foreign exchange reserves. It is at this time when scholars first noticed a strong link between money and the foreign exchange market since developments in treasury bills market were riding on the high interest rate differential that was attracting capital

inflows. Capital inflows in turn increased appreciation of exchange rate and CBK had to intervene to address appreciation. In 1996, CBK sterilized liquidity through selling massive treasury bills and interest rate peaked to 6% and since then the rate has always been within the 6% to 9% with an abnormal high of 16.5% in November 2011. However, the interest rate by commercial banks and other financial institutions has been fluctuating across period and has been greatly influenced by inflation patterns. The average real interest rate in 1990 was 7.3%, in 2000 was 15.3% and in 2010 was 11.9% (World Bank Indicators). Below charts shows the trends for both nominal and real interest rates as well as real exchange rate in Kenya.

### 1.2. Research Problem

Movements in either Interest rate results in movement in exchange rate and vice versa. While many research works have identified interest rate as one factor affecting exchange rate, the relationship between the two variables still remains unclear. Some scholars like Ndung'u (2000) have argued that interest rate and exchange rate absorbs shocks from each other. Liberalization in Kenya has depicted all-time high interest rates even during times of low inflation. Kenya's economy has remained in a deflationary trend for the last two decades. At the same time, exchange rate has remained volatile. There has been short-run capital flows as a result of interest rate differential. Capital flows are critically portfolio flows that arise from speculation (Nyamwange, 2009). There has been conflicting goals in CBK's effort to manage exchange rate resulting in policy dilemma. This dilemma relates to targeting low inflation and competitive exchange rates in the floating exchange rate regime. CBK occasionally intervenes in foreign exchange market trying to defend nominal exchange rate when faced with volatile capital flows. This action has however necessitated that CBK follows the capital flows by raising interest rates in the money market. As a result of this action, response exchange rate is stabilized but at the

expense of high interest rates. This jeopardizes efforts to enhance economic recovery and increase domestic investment.

Kiptui and Kipyegon (2008) conducted a study on external shocks and real exchange rate movements in Kenya, the real exchange rate has demonstrated several changes since it was liberalized in 1993. They used error correction model (ECM) to examine short-run and long-run dynamics of external shocks in real exchange rates for the period 1996 to 2007. The study identified that Kenya's real exchange rate has in some phases recorded a depreciation of 21% as seen for the period between January 1995 and October 1999. In other phases, the rate has been stable as was the case in the period between October 1999 and December 2004. In the period between 2005 and 2007, the real exchange rate depreciated by 30%.

Musyoki et al. (2012) explored the real Exchange rate equilibrium and misalignment in Kenya for the period 19993 to 2009. The study made use of error correction technique and Johansen co-integration and was based on Vector Autoregressive Specification (VAR). The study established that the actual real exchange rate in Kenya is more often above the equilibrium value and at the same period, the country's global competition over the period. The study concluded that adopting floating exchange rate did not attain its intended purpose which was to reduce RERI overvaluation and general misalignment. Ndung'u (2000) carried out a study on exchange rate and interest rate and how the two give rise to monetary and fiscal dilemma in Kenya. He concluded that nominal exchange rates in Kenya deviate from long-run equilibrium level that is determined by purchasing power parity relationship and these deviations are as a result of interest rate differentials. From his findings, exchange rate and the real interest rate differential absorb shocks from each other. This relationship implies that if the economy was to put effort in

closing the real interest rate differential gap by lowering interest rate, the result would be consistent depreciation in exchange rate.

Against this kind of background in research findings, policy makers in various government institutions have been faced with a dilemma on how to address depreciation in Kenya Shilling while maintaining desired rate of interest. Most of policies and actions directed at maintain a desired rate of exchange has often left the economy suffering high real interest rate (Ndung'u, 2001). Various studies have been conducted on Real Interest rate and Real Exchange rate and how the two have impacted on various economies. All these studies raise the question on the relationship (its existence and the kind) between Real Interest rate and Real exchange. This study developed on some of the insights given by various scholars with the aim of describing the kind of relationship that is seen between real exchange rate and real interest rate. The study explored potential policy implications and suggests how the dilemma in monetary policy can be managed.

### 1.2.1 Research Question

The study sought to answer the following research question:

i. What is the trend in real exchange rate and real interest rate in Kenya and the nature of relationship between the two variables?

## 1.3 The Objective

The main objective of this study was to establish the relationship between the real exchange rates and the real interest rates.

## 1.4 Value of the Study

This study will provide policy lessons relating to the management of exchange rate and interest rate structure. With an open capital account and a floating exchange rate, Kenya needs well thought out policy in its management of the two rates. This makes the study relevant to policy

makers particularly in the context of Central Bank of Kenya. This study will guide policy makers in the Central Bank of Kenya and the Treasury in coming up with policies which can manage exchange rates and spur growth and profitability in Kenya's economy. This study will be beneficial to Central Bank analysts and particularly the Central Bank Governor in terms of policy making particularly on the monetary policy. It will help them to better understand conflict between real interest rate differential and real exchange rate and the best policy response to changes in the two factors.

The study is also relevant to policy makers in the context of International Monetary Fund in their understanding of Kenya's key Economic indicators. IMF requires understanding of countries' dynamics and this would help in adopting relevant economic reforms as conditions to the loans advanced to developing nations. Current conditions to these loans include reduced government borrowing, high interest rates that focus on stabilizing currency and structural adjustments. These conditions are however ignorant of dynamics in different economies. For instance, IMF intervened in Kenya in 1990 and urged Central Bank to cease control over capital flows. This move has however made it easy for corrupt government officials and politicians to engage in Goldman Scandal (transferring money out of the economy of Kenya). This indicates how blanket reforms can yield failure in an economy. Understanding of the real interest and real exchange rate relationship would enable IMF to review their economic reforms by adopting relevant economic reforms.

The study will also be relevant to institutions in the field of economics, finance and banking who may use this study as a guide in designing their exchange rates for commercial transactions. This study will be a contribution to the already existing academic work done by other scholars both locally and internationally. Various empirical studies related to the topic, in Kenya have been

conducted such as Nyachieo (2008) on exchange rates and volume of horticultural exports, Nyamute (1998) on inflation rate, Treasury bills rate and exchange rates, Opati (2009) on inflation and exchange rates, and several others.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

This section comprises of two main sections. The first part constitutes review of various theories that purport to explain foreign exchange rates and interest rate differentials. This part has discussed three theories that are critical in understanding of exchange rate and interest rate. These are balance of payment theory, interest rate parity theory and purchasing power parity theory. The second part constitutes review of empirical evidence of various empirical research studies related to the area of this study. The part also discusses knowledge gaps identified from review of various schools of thoughts by different scholars and finally provides a chapter summary.

## 2.2. Theoretical Review

### 2.2.1 Purchasing Power Parity

This theory was founded by Gustav Cassel in 1918 and it asserts that change in exchange rate between two currencies for any given time period is determined by change in the countries relative price levels. The theory singles out changes in price level as the key determinant of movements in exchange rate (Otuori, 2013). This implies that efficient markets should have one price and the same for identical goods. The theory of purchasing power parity measures one currency's purchasing power against another taking into account the exchange rate. The theory assumes that without transaction costs, identical goods would have similar prices in different markets.

PPP says that price differentials in the long run are not sustainable since market forces eventually equalize prices between the countries as well as changes the exchange rates. Arbitrage opportunities enable market forces to enhance equilibrium in prices. According to Otuori (2013), one of the weaknesses of PPP is that the theory requires very strong assumptions. The theory holds in a competitive and integrated product market where risk is neutral. The theory assumes that goods can be freely traded without costs like tariffs, transportation and export quotas. However, these are unrealistic assumptions in a real market where costs like transport and costs related to trade barriers are inevitable. PPP is therefore deemed as a condition of market equilibrium where foreign and domestic market is integrated to a single market. It is because of these impractical conditions of PPP that the theory fails in explaining practical phenomenon. PPP is often used in forecasting future rates of exchange (Isard, 1995). A study carried out by Dornbusch (1985) concluded that PPP serves as exchange rate prediction model and therefore gives important insight in guiding monetary policy.

### 2.2.2 Interest Rate Parity Theory

This theory was developed by Keynes in 1923 and it suggests that interest rate differential noted between two countries is equal to the two countries' differential between spot exchange rate and forward exchange rate. This theory plays a critical role in exchange markets by connecting spot exchange rates, foreign exchange rate and interest rates. Interest rates, inflation and exchange rates are all highly correlated. By manipulating interest rates, central banks exert influence over both inflation and exchange rates, and changing interest rates impact inflation and currency values (Alexius, 2001). Higher interest rates offer lenders in an economy a higher return relative to other countries. Therefore, higher interest rates attract foreign capital and cause the exchange rate to rise. The impact of higher interest rates is mitigated, however, if inflation in the country is

much higher than in others, or if additional factors serve to drive the currency down. The opposite relationship exists for decreasing interest rates - that is, lower interest rates results in lower exchange rates.

Interest rate parity theory states that the spot price, the futures and the forward price of a currency incorporates interest differentials that could be there between any two currencies. This is in assumption of no taxes or transaction costs (Alexius, 2001). The theory states that discount or premium of one currency against another currency should reflect interest differential between the two currencies. The currency whose interest is lower should have a forward premium in relation to the high rate currency. In an efficient market where no transaction costs are experienced, interest rate differential should approximately equal the forward differential and once this condition is met, forward rate is said to be at the interest rate parity where equilibrium prevails in the a money market. Interest parity ensures return of a hedged foreign investment is equal to the interest rate that would be realized on an identical domestic investment meaning that the difference between hedged foreign interest rate and a domestic rate is zero. Interest parity theory represents one of the most and best documented areas of finance particularly in international finance.

As stated by Chinn and Meredith (2004), Euro currency markets use interest differential between the specified two currencies (using no-arbitrage condition) when calculating the forward interest. Interest rate parity plays a critical role in foreign exchange markets by connecting foreign exchange rates and spot exchange rates. To sum it, interest rate differential for two countries equals the differential between a spot exchange rate and a forward exchange rate. This theory suggests that foreign exchange trading is what brought about interest rate parity theory. This theory suggests that domestic interest rate should be equal the foreign country's interest rate plus

speculated change in exchange rate. This theory is therefore relevant in understanding the relationship between exchange rate and interest rate. One of the weaknesses of the interest parity theory is that it is built on two assumptions; the theory assumes that markets are efficient, with capital mobility and that the domestic and foreign assets are perfectly substitutable.

### 2.2.3 The Balance of Payments Theory

This theory was developed by Krueger in 1969. This theory is also called the demand and supply theory of exchange rate. According to the theory, exchange rate in foreign exchange market is determined using the balance of payments in the sense of demand and supply of foreign exchange in the exchange market. Balance of payments gives a record of international payments arising from various international transactions like imports, exports, investments as well as financial, commercial and speculative transactions (Isard, 1995). Balance of payment includes all payments arising from foreign exchange. All incoming payments in the balance of payments constitute credits while the outgoing payments constitute debits. Credits in the balance of payments constitute the supply of foreign exchange made by the exporting countries. On the other hand, debits constitute the economy's demand for foreign exchange arising from the importing countries. Any surplus or deficit realized in the balance of payments results in changes in the demand or in the supply of foreign exchange leading to fluctuations in the foreign exchange rate. Deficit results from demand being higher than supply while surplus results from supply of foreign exchange being more than demanded amounts. With a deficit, the exchange rate rises (domestic currency depreciates) while with a surplus, exchange rate declines (domestic currency appreciates). The lower the exchange rate the lower the foreign exchange supply and vice versa thus the supply curve for foreign exchange rate slopes downward while demand curve slopes upward.

According to Kanamori and Zhao (2006), the balance of payments theory of exchange rate also called General equilibrium theory of exchange rate is relevant in understanding foreign exchange rates. According to this balance of payment theory, foreign exchange rates in the foreign exchange market is determined by use of balance of payments whereby supply and demand of foreign exchange determines the rate used in the market. When foreign exchange demand is higher than supply, price of foreign currency rises while lesser demand for foreign exchange results in declined price for the currency (Kanamori & Zhao, 2006). Changing levels of demand and supply for foreign exchange results from the debit and credit items in the balance of payments. Increased demand for foreign exchange arises from the debit side of balance of payments. These debit items in balance of payments include import of goods and services and Loans and investments that are made abroad (Kanamori & Zhao, 2006).

The supply of foreign exchange arises from the credit side of the balance of payments. It is made up of the exports of goods and services and capital receipts. Unfavorable balance of payments of a country results in a decline in rate of foreign exchange. On the other hand, favorable balance of payments results in increased rate of exchange. The domestic currency can purchase more amounts of foreign currencies (Kanamori & Zhao, 2006). When the exchange rate of a country falls below the equilibrium exchange rate, it is a case of adverse balance of payments. The exports increase and eventually the adverse balance of payment is eliminated. The equilibrium rate is restored. When the balance of payments of a country is favorable, the exchange rate rises above the equilibrium exchange rate resulting in the decline of exports (Kanamori & Zhao, 2006). The weakness of Balance of payment theory is that it is built on some assumptions some of which are unrealistic. The balance of payments theory of exchange assumes a contemporary integrated world markets, which is not an unrealistic approximation. The theory also assumes

limited holding of stocks and long lags in markets' information dissemination. This is particularly challenged by the advancement in technology application in both commodity and stock markets, which has led to sharing of real time information in the market.

### 2.3 Determinants of Exchange Rate

Exchange rate is one of countries' key determinants of relative level of economic health. It plays a vital role in the level of trade particularly in free market economies. It is for this reason that economies are keen to watch exchange rate, analyze it and manipulate it. The exchange rate also impact on investors' portfolio and thus also matters on a smaller scale. As discussed by Otuori (2013), various factors influence exchange rate and are all related to trading. These include inflation differentials, interest rate differentials, public debt, current account deficits, terms of trade (balance of payments) and political stability. As mentioned by Ndung'u (2000), interest rate, exchange rate and inflation are all highly correlated. By manipulating interest rate, CBK exerts pressure on both inflation and exchange rates. Lower rate of inflation exhibit a rising currency value.

#### 2.3.1 Inflation Rate

Country with lower rate of inflation has greater purchasing power against other currencies and is likely to show rising value of its currency. High rate of inflation lowers currency value and as inflation increases the currency realizes increasing depreciation.

#### 2.3.2 Interest Rate

Most monetary committees change interest rates if they want to influence their countries' rate of exchange and inflation. Higher rates of interests attract investors and benefit them but in results

in increased foreign capital and rising foreign exchange rates. Low rates of interest create an opposite scenario.

### 2.3.3 Public Debt

Large public debts bolsters inflation which implies that debt is eventually paid with cheap real dollars. This means therefore that large public debt attract less of foreign investment. Some government may actually print money to pay part of their debts, which increases money supply resulting in inflation increase. Making a country less attractive affects foreign exchange rate.

### 2.3.4 Terms of Trade

Export and import price ratio is referred to as the terms of trade and it affects foreign exchange rate. Rising price of exports improves terms of trade, which in turn improves foreign exchange rate and vice versa.

## 2.4 Empirical Review

There are various policy variables that are critical in understanding movements in real interest rate and real exchange rate. It is not easy to identify a more appropriate structural model that explains short term capital flows. Goldstein et al. (1991) examined the determinants of international capital flows and the consequences of the flows. He used data drawn from the period 1970s and 1980s. He identified that capital markets integration has strengthened inducements for increased international coordination of financial and economic policies. He further stated that structural changes observed in financial markets have undermined effectiveness of fiscal and monetary policy and further complicated foreign exchange market by developing countries. As put by Goldstein et al. (1991), it is however difficult to come up with a structural model to explain short-term capital flows because short-term capital movements reflect

stock adjustment in the arbitrage process. They further mentioned that capital flows reflect a risk perception by the economic agents. His interest however, was to show how the real exchange rate is affected by the movements in the short-term capital flows as well as to account for the effects of other macro variables on the exchange rate in the liberalization period and thus reveal areas of interdependence and policy weakness.

Ndung'u (1991) carried out a study on liberalization and adjustment in Kenya. The study analyzed liberalization and its impact on two markets in the economy; the foreign exchange market and the financial market. The study identified that exchange rate policy changes the inflation profile and that interest rates increases with liberalization. He concluded that this scenario reflects inefficiency in the economy's financial market while domestic and foreign interest rate differentials and short-term capital flows affect the real exchange rate. The study identified that targeting a competitive exchange rate and a low inflation rate using interest rate as the only policy instrument presents a policy dilemma. Ndung'u (1991) mentioned that such policy conflict complicated macroeconomic management in Kenya in 1990s since the environment had not had fiscal adjustments.

Baxter (1993) investigated the relationship between real interest differentials and real exchange rates for a specified floating-rate period. His data was drawn from board of governors' database at Federal Reserve Bank of Minneapolis. The study applied both multivariate and univariate approaches in data analysis. In his study, he evidenced a weak relationship between the two and concluded that there was a strong link between the two variables which links further to the business cycle frequencies. Baxter however failed to find the policy variables influencing movements in the two rates. He further concluded that the movements in real interest rates and

real exchange rates and the policy variables explaining the movements remains an empirical problem.

Understanding the relationship between real interest rate and real exchange rate requires a more appropriate model or technique of analysis. Alam et al. (2001) carried out a study on the long-run relationship between real interest rate and real exchange rate in Asian countries. They used panel cointegration technique, which they argued to have been the secret behind establishing clear long-run relationship between real interest rate and real exchange rate. In their study, they used panel root test for testing their hypothesis and later on tested the long-run implications of the cointegration of the two rates. The study used panel cointegration tests and Johansen-cointegration to test the entire sample period for ten countries located in South East Asia and South Asia including Pakistan, Thailand, Singapore, Sri Lanka, Philippine, Malaysia, Korea, Indonesia, India and Bangladesh. Statistics derived from Johansen-cointegration indicated strong evidence of cointegration of the two rates (real interest and real exchange rate) in the case of nine out of the ten countries.

Kenya has actively implemented various economic reform measures. Interest rates and foreign exchange markets have been liberalized since 1990. Ndungu (2000) analyzed the relationship between real interest rate differential and real exchange rates and further explore the effect of speculative private capital flow, and the external and domestic shocks on economy's real exchange rate. Liberalization process has had some handicaps including price instability and inflation levels often rising. As mentioned by Ndun'gu (2000), as the process of liberalization continued, the financial market showed short-run fluctuations due largely to the volatility of foreign exchange flows. The primary goal of exchange rate and monetary policies shifted due to conflicting objectives and troubles facing the authorities with the incidence of heavy capital

inflows. In 1994, the policies' focus was to maintain the targeted level of reserve money while still exercising interventions in the foreign exchange market in effort to reduce or minimize the exchange rate appreciation. Foreign exchange market interventions led to improved level of money supply. This was in turn sterilized through sale of Treasury bills in open market operations (OMO). As mentioned in the study carried out by Ndungu (2001), to make the commercial paper attractive, the rate of interest had to be high relative to other financial assets. This cushioned domestic prices and also led to high Treasury bill rates.

Ndungu (2001) carried out a study on Liberalization of Kenya's foreign exchange market and the flow of short term capital. In his study, he mentioned that exchange rate is affected by various variables and policy actions. Among these variables is short-term capital movement. He concluded that exchange rate changes are driven by the real interest rate differentials and these in turn generates capital flows. The study stated that there is a structural relationship between real exchange rates and real interest rate differentials. Volatility of capital flows in turn affect real exchange rates as evidenced in Kenya during the period 1980s and 2000s during the foreign exchange market liberalization. He however acknowledged that establishing a structural model of the relationship is hard given that short-term capital flows are as a result of arbitrage process adjustments. Capital flows reflect perception of risk by economic agents (Ndung'u, 2001). He further argued that effectiveness of monetary policy in Kenya faced challenges due to government's control of financial market and failure to develop secondary market where long-term and short-term government commercial papers would be traded. This is what kept Kenya's banking sector behind in terms of development. He further mentioned that the monetary policy tool has often been used for the wrong motives like solving Treasury's problems of short-term liquidity.

It is important to also look at the trend and the relationship of the two rates in other countries. Bautista (2005) carried out a study on the relationship between exchange rate and interest rate differential in six East Asian economies. The study covered the period 1986 to 2004 and used dynamic conditional correlation multivariate model (DCC model). Countries covered included Korea, Malaysia, Philippines, Thailand, Singapore and Indonesia. The study findings showed that the relationship between interest rate differential and exchange rate in the Asian countries changes with a change in nominal regime. The study found that correlations are negative in times of freely falling regimes and positive in times of pegged regimes.

Koranchelian (2005) carried out an empirical study within the context of Algeria to explore equilibrium in exchange rate in a commodity exporting economy. He found that real oil prices explain Algeria's long-run evolution in equilibrium of real exchange rates and in turn the interest rates in the market. The study findings identified that on average the life of any deviation of rate of exchange from the equilibrium is about nine months. The study concluded that commodity exporting economies do not struggle with foreign exchange fluctuations and their real exchange rate is often in line with equilibrium rate.

According to a study conducted by Kiptui and Kipyegon (2008), on external shocks and real exchange rate movements in Kenya, the real exchange rate has demonstrated several changes since it was liberalized in 1993. They used an error correction model (ECM) in capturing short-run and long-run dynamics of external shocks arising on real exchange rates or the period 1996 to 2007. Error Correction Model (ECM) is a multiple time series that estimate speed of movement of the dependent variable back to equilibrium, as a result of a change in an independent variable. The model is theoretically driven and is used in estimating long-term and short-term of time series. The ECM model included domestic variables like interest rates

differential, government spending and GDP growth. The study identified that Kenya's real exchange rate has in some phases recorded a depreciation of 21% as seen for the period between January 1995 and October 1999. In other phases, the rate has been stable as was the case in the period between October 1999 and December 2004. In the period between 2005 and 2007, the real exchange rate depreciated by 30%.

Hoffman (2009) carried out an empirical study on whether real exchange rate and real interest rate relationship is significant. The study focused on proving most macroeconomic models whose empirical support of the relationship showed that the relationship was weak. The study used data drawn from quarterly bilateral U.S. real interest rate differentials and real exchange rates Vis-à-vis other G7 countries. According to Hoffmann (2009), the study provided empirical evidence that real interest rate and exchange rate relationship is economically significant. The study also showed that real interest rate differential can reasonably be used to forecast the expected depreciation rate. Analyzing how exchange rate affects various economic elements is critical in the understanding of exchange rate movements. Such elements include stock prices, exports and savings. For instance, Kisaka (2012) examined the relationship between stock prices and exchange rates in Kenya for the period 1993 and 1999 using monthly data observations of stock price index at NSE. The objective of the study was to identify any causal linkages between foreign exchange rate and stock prices. The study results indicated that the two are non-stationary and they reflect integration of order one. Further test for co-integration proved that the two variables are co-integrated. The study shows that foreign exchange rates affect stock prices.

Higher level of exports and imports drives profitability in commercial banks. Ongeri (2013) carried out an empirical study with the aim to investigate the determinants of exchange rates and their impact on the performance of commercial banks in Kenya. The study used a descriptive

design with primary data that was collected through self-administered questionnaires. Results from the study findings showed that interest rate and external debt have positive and important effects on economy's performance while inflation rate and external debt had negative and significant effects on performance. From the study findings, conclusion was drawn that higher levels of interest rate leads to higher profitability in Kenya's commercial bank. The study also concluded that high levels of inflation rate results in lower banks' profitability in the Kenya market while higher levels of economy's external debt results in lower bank profitability. Recommendations from this study were that the Central Bank of Kenya should enhance banks profitability by setting base lending rates and at the same time not be punitive to the borrowers. Secondly, inflation rate in Kenya should be contained by use of sound policy measures since higher inflation rates hurt the performance of commercial banks in Kenya.

It is important to analyze the role of interest rate differentials, which influences net capital inflows, in exchange rate movements. Were et al. (2013) carried out an empirical study on interest rate differentials and identified that real interest rate differentials are critical in determining the shilling exchange rate. This study is consistent with earlier empirical evidence in a study by Ndung'u (2001). From the findings of Were et al. (2013), real interest rate differentials in Kenya explain the short-run exchange rate movements. Also, the empirical results from the study indicate that that real net foreign direct investments and portfolio flows were commonly subdued for the better parts of 1996 - 2008, and so were the official development aid flows and remittances. In the same period, the short term external debt as a share of exports, part of total external debt of the economy was between 5% and 25%. Deviations from the uncovered interest parity are estimated to be biggest in Kenya among comparative countries. Risk premium adjusted real interest rate differentials ought to have some variance. This is helpful when

empirically analyzing role of interest rate differentials (an underlying factor in net capital inflows) in exchange rate movements.

A study carried out by Otuori (2013), investigating the determinants of exchange rates and how they affect performance of commercial banks in Kenya, identified such determinants as interest rate, public debt, inflation and terms of trade. The study used descriptive research design and primary data was gathered through self-administered questionnaires. The study findings indicated that external debt and interest rate have positive effect on banks performance while inflation rate negatively affected banks' performance. He further concluded that high interest rate levels increase banks' profitability in Kenya. The study also highlighted that high level of exports and imports improve banks profitability. He further recommended that government should address the heavy external debt and inflation rate that hurts banks performance.

**2.5 Summary**

From the three theories of exchange rate discussed, there is agreement in founders' view that interest rate and exchange rate demonstrate some relationship. As highlighted by Otuori (2013), some of the theories like the PPP hold under strong assumptions that makes them fail in explaining practical phenomenon. PPP assumes a condition of market equilibrium where foreign and domestic market is integrated to a single market. It is because of these impractical conditions of PPP that the theory fails in explaining the behavior of exchange rates between two market economies. The findings of the study conducted by Ongeri (2013), Goldstein et al. (1991) and Ndung'u (2001, 2006) agree in that short-term capital flows affect foreign exchange rate and further puts policy makers in dilemma as to whether to raise interest rates or not.

Various studies conducted indicate that there is a relationship between interest rate and exchange rate. However, some indicate that the economic relationship is too weak to prompt any interest in

how the two affect each other (Baxter, 1991). Some of the empirical reviews like Baxter (1993) and Ndung'u (1991, 2006), have given conflicting evidences whereby Ndung'u identifies a strong economic relationship between real interest rates and real exchange rates while Baxter (1993) purport that the relationship is actually very weak. However, his findings confirm that the short-term capital flows that results from interest changes go further to influence exchange rate. Hoffman (2009) supports the view that the relationship between real interest rate differential and real exchange rate is economically important. His study also showed that real interest rate differential can reasonably be used to forecast the expected depreciation rate. The study carried out by Koranchelian (2005), in Algerian context showed that the case of interest rates, short-term capital flows and exchange rates that result in policy dilemma in most developing countries is actually different in oil producing countries. His study indicated that commodity exporting economies do not struggle with foreign exchange fluctuations and their real exchange rate is often in line with equilibrium rate.

Alam et al. (2001), has conclusively indicated that there is a relationship between real exchange rate and real interest rate. However, his study covers Ten Asian countries and given the difference in economic development between African and particularly Kenya, and the Asian countries, his study may not form the best reference in concluding the case for Kenya. In addition, his findings may have been contradicted by Bautista (2005), whose study found that the relationship between Interest rate differential and exchange rate is determined by the changes in the nominal regime, whether the regime is pegged or freely falling. The varying views of different scholars regarding the nature and significance of the relationship between real interest rates and exchange rates shows that there is need for more scholarly work in this area of study.

# CHAPTER THREE

# METHODOLOGY

## 3.1 Introduction

This chapter describes the procedures and methodologies that was undertaken in conducting the study to arrive at conclusions regarding the relationship between the real interest rates differential and exchange rates in Kenya. Specifically, the chapter covers: research design; data collection, data analysis and model specification.

## 3.2 Research Design

### 3.2.1 Correlational Research Design

One can make use of various research designs in testing hypothesis. Correlation research design is applied where the researcher wants to determine if two or more variables or factors are related or correlated. It is often difficult to determine if one factor causes a change in the other identified factor. This is because there might be other possible factors that influence the behavior of the other factor. Where the researcher has no control over other factors influencing change in the other factor, it is advisable to use correlational research design. The design enables the researcher to determine whether factors are related rather than determining if one factor causes a change in another factor. In correlational design, the researcher makes measurements of each individual variable and then computes correlation coefficient, which is a statistical measure that gives the strength and direction of correlation between two factors. The value of correlation coefficient (r) ranges between -1 to +1 (Saunders, et al., 2007). This implies that the direction of the relationship can be negative or positive. On the other hand, the strength of the relationship is described be correlation coefficient value. Where (r=0), meaning zero correlation, it implies that

there is no linear relationship or pattern between the variables. The closure the r value is to zero, the weaker the correlation and vice versa.

### 3.3 Data

#### 3.3.1 Type of Data

The study made use of secondary data collected from different sources. Secondary data is the second hand data that is gathered from already existing materials such as books, peer-reviewed journal articles, websites and other relevant materials (Saunders, et al., 2007). The main line of inquiry in this research was limited to floating exchange rate value and real interest rates value for the period between 1994 and 2013. The main sources of data identified for this study included Central Bank of Kenya (CBK), Treasury, International Monetary Fund (IMF) and World Bank. Other sources of secondary data included scholarly materials. Different scholars have written different materials on interest rate differentials, exchange rates and fiscal and monetary policies in Kenya. The study maximized on scholarly materials done locally since they are expected to be contextual and consistent with the unit of analysis in this study.

#### 3.3.2 Data Collection

Secondary data was also gathered from peer-reviewed journal articles that have been written by scholars on the subject. Secondary data from Institutions like World Bank and IMF was accessible through the institutions' websites. Some data was not readily accessible from the identified institutions like the Kenya Bureau of Statistics, and required booking of appointment with their offices so that the researcher could be given the time and the guidance that was required in data collection. The researcher also did put effort in visiting the libraries in these institutions like World Bank where relevant journals and data were readily available. Other secondary data was gathered from books and other materials and will be analyzed.

### 3.4 Data Analysis

Data analysis refers to the process of putting together facts and figures in effort to solve a research problem. Various techniques of data analysis include narrative, descriptive, statistical and audio-optical methods. This study adopted statistical methods making use of descriptive and inferential statistics. The data collected in this study was analyzed using Statistical Package for Social Sciences (SPSS) as well as using descriptive analysis model. The research study took a correlational research design and used regression model. The study also examined the correlation of the two variables using correlation model in determining correlation. The model determines the strength and direction of relationship on intervals or ratio scale measurement. The strength and direction of correlation can also be identified using a graph called scatterplot. Scatterplot is plotted using data points (pair of values) along y-axis and x-axis. Extent to which the variables in question are related is determined the distance by which data points fall away from regression line. Regression line refers to the best-fitting line or the closest fitting line in a given set of data points. Best-fitting line is a line that minimizes the distance by which data points fall away from each other. The closer the given set of data points from regression line, the stronger the relationship or the correlation between the variables. This study used both correlation coefficients value and the regression model in determining and illustrating the strength and direction of the relationship between real exchange rate and real interest rate. Regression coefficient was deemed most appropriate analysis technique for the study as it aimed at determining relationship between the two variables.

To test for significance, the study will examine t-test used and its value, the degrees of freedom and the value of alpha (p-value) (Saunders, et al., 2007). Tests for significance are important in that they help in estimating if the relationship observed in the data occurred only by chance.

### 3.4.1 Statement of Hypothesis

Null Hypothesis: H0 There is no relationship between real interest rate and real exchange rate

Alternative hypothesis: H1 There is a relationship between real interest rate and real exchange rate.

### 3.4.2 Statistical Model

The model to be adopted will be as follows:

$Yi = \alpha + \beta x + \varepsilon$

Where: Yi = Real Exchange rates in Kenya

X1 = Interest Rates (in %, Annualized)

ε= Error terms

The parameter α represents a control variable, which in the model is assumed to represent public debt. We are assuming that public debt may be a control variable because it influences inflation, which in turn influence exchange rate. Having adjusted interest rate for inflation to get real interest rate, then the public debt effect is taken care of making the debt remain a control variable. Public debt is one of the determinants of exchange rate and is a core challenge in the Kenya economy. The country recorded a public debt equivalent to 51.70% of the country's GDP in 2013; this is according to World Bank Statistics for Kenya government Debt to GDP for the period 1998 to 2013.

# CHAPTER FOUR

# DATA ANALYSIS, RESULTS AND DISCUSION

## 4.1 Introduction

This chapter involved analysis of data collected and discussion of the results obtained. The chapter presents findings with regards to the relationship between real exchange rates and real interest rates. The chapter also presents descriptive analysis of the findings with regards to the both the independent and dependent variables.

## 4.2 Findings

The study made use of secondary data collected from different sources. The main line of inquiry in this research was limited to floating exchange rate value and real interest rates value for the period between 1994 and 2013. The main sources of data identified for this study included Central Bank of Kenya (CBK), Treasury, International Monetary Fund (IMF) and World Bank. Other sources of secondary data included scholarly materials. The data used was KES/USD Annualized Average Exchange Rates (Forex), Annualized Average real Interest Rates (in %), Annualized public debt to determine the effects of real interest rate on real exchange rates in Kenya. The study assumed to have considered effect of inflation rate by considering interest rate adjusted of inflation (real interest rate).

### 4.2.1 Checking for Non-Stationarity: Autocorrelations

The study made use of the PACF functions in determining the presence and nature of non-stationarity (Figure 4.1).

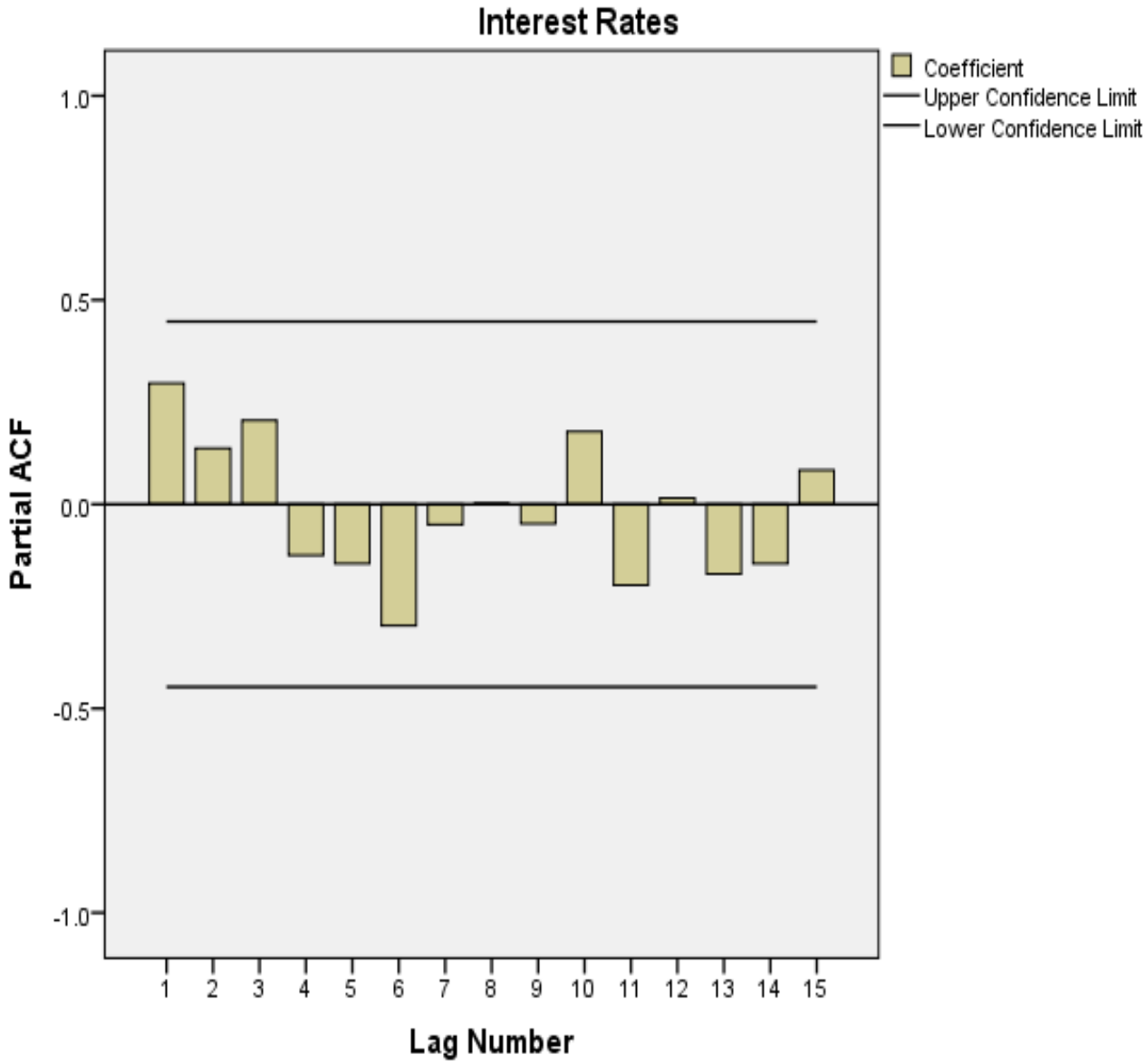



**Figure 4.1: PACF Interest Rates**

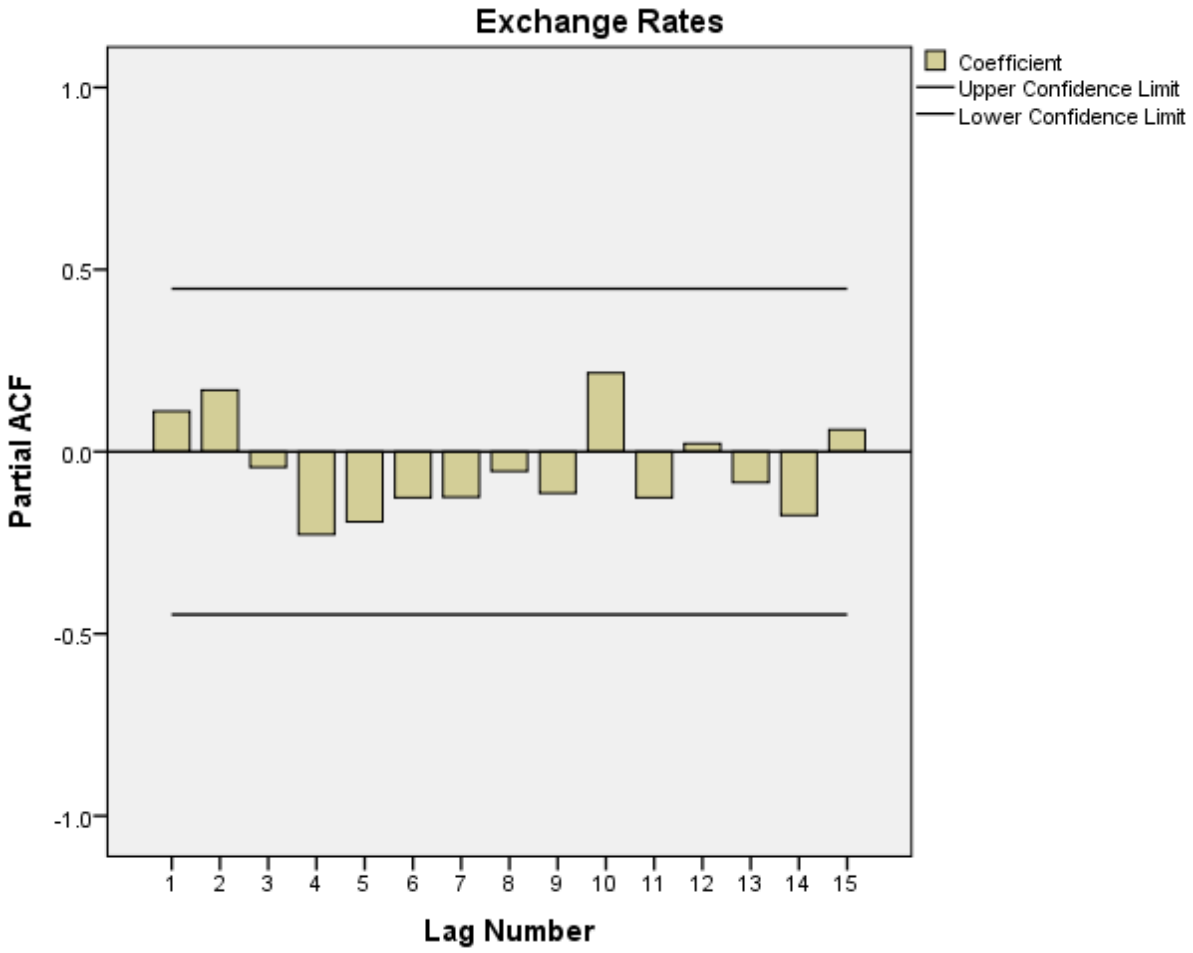



**Figure 4.2: PACF Exchange Rates**

As seen in figure 4.1 and 4.2, none of the partial-autocorrelation coefficients are above the critical limit. This indicates the absence of non-stationarity and strongly indicates no need to use of first-order differenced transformations of this variable in any regression analysis.

### 4.2.2 Regression Analysis

The study sought to examine the relationship between real interest rates and real exchange rates. A linear regression model was used since there was non-stationarity in the data obtained.

**Table 4.1: Model Summary**

| Model | R | R Square | | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|---|
| 1 | .671[a] | .450 | | .419 | 7.0732738 |

a. Predictors: (Constant), Interest Rates

As seen in table 4.1 The R-square value was .450 indicating that 45 percent of changes in real exchange rates is as a result of changes in real interest rates. This also means that the remaining percentage is as a result of other variables not included in the model. The ANOVA table 4.2 further shows the same results.

**Table 4.2: ANOVA Table**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 736.698 | 1 | 736.698 | 14.725 | .001[b] |
| | Residual | 900.562 | 18 | 50.031 | | |
| | Total | 1637.259 | 19 | | | |

a. Dependent Variable: Exchange Rates

b. Predictors: (Constant), Interest Rates

As seen in the ANOVA table 4.2 it is evident that at the 5% (0.05) significance level, the model is useful for predicting the response since;

F Value = 14.725 and P-value at 0.01 is less than 0.05.

Table 4.3 Presents the coefficients values after running the regression analysis.

**Table 4.3: Coefficients**

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 17.479 | 2.450 | | 7.135 | .000 |
| | Interest Rates | -.756 | .197 | -.671 | -3.837 | .001 |

a. Dependent Variable: Exchange Rates

As presented in table 4.3 it was evident that indeed there is a negative significant relationship between real exchange rates and real interest rates with a beta value of -.756 and p value =.001.This implies that indeed interest rates negatively affect the real exchange rates.

### 4.2.3 Real Exchange Rates and Real Interest Rates as controlled by Public Debt

The study further sought to examine the relationship between real exchange rates and real interest rates when public debt is the control variable.

**Table 4.4: Model 2: Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .671[a] | .450 | .419 | 7.0732738 |
| 2 | .709[b] | .502 | .444 | 6.9238410 |

a. Predictors: (Constant), Interest Rates

As seen in table 4.4, it is evident that when public debt controls for interest rates the R square value increases to .502. The ANOVA table 4.5 further presents additional findings on the significance of the model.

**Table 4.5: ANOVA Table 2**

**ANOVA[a]**

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 736.698 | 1 | 736.698 | 14.725 | .001[b] |
| | Residual | 900.562 | 18 | 50.031 | | |
| | Total | 1637.259 | 19 | | | |
| 2 | Regression | 822.287 | 2 | 411.143 | 8.576 | .003[c] |
| | Residual | 814.973 | 17 | 47.940 | | |
| | Total | 1637.259 | 19 | | | |

a. Dependent Variable: Exchange Rates

b. Predictors: (Constant), Interest Rates

c. Predictors: (Constant), Interest Rates, Public Debt

Table 4.5 shows that the model is still significant even after the introduction of public debt as a control variable with F Value = 8.576 and P-value at 0.03 which is less than 0.05. Table 4.6 further presents the coefficients of the model.

**Table 4.5: Coefficients table 2**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 17.479 | 2.450 | | 7.135 | .000 |
| | Interest Rates | -.756 | .197 | -.671 | -3.837 | .001 |
| 2 | (Constant) | 28.837 | 8.832 | | 3.265 | .005 |
| | Interest Rates | -.819 | .199 | -.726 | -4.124 | .001 |
| | Public Debt | -1.739E-009 | .000 | -.235 | -1.336 | .199 |

a. Dependent Variable: Exchange Rates

As presented in table 4.5 it is evident that there still exists a negative significant relationship between real interest rates and real exchange rates with a beta -.819 and a p value of .001, when public debt is a controlling variable.

### 4.2.4 Descriptive Statistics

#### 4.2.4.1 Exchange Rate Trends (1994-2013)

Figure 4.3 presents exchange rate trends for the period between 1994 and 2013.

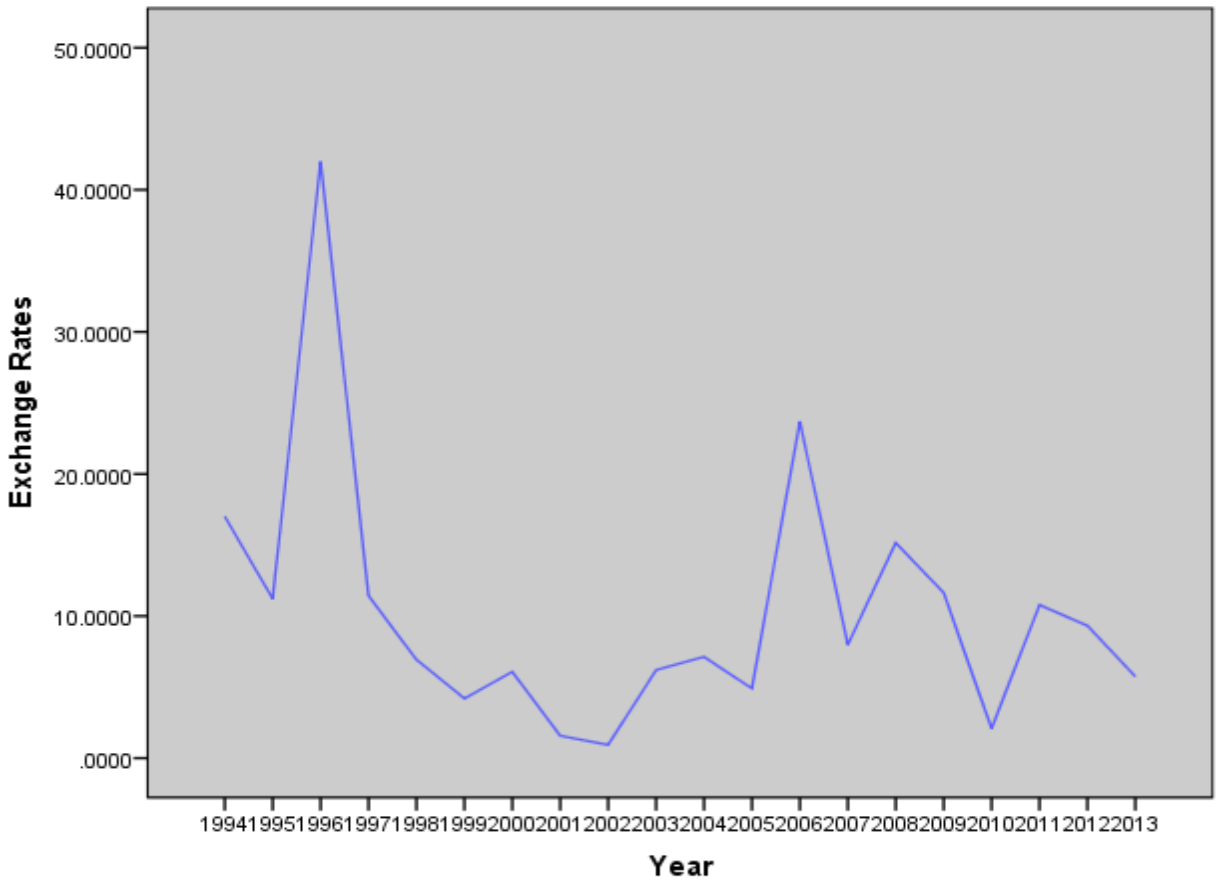



**Figure 4.3: Exchange Rate Trends (1994-2013)**

As seen in figure 4.3, it is evident that the exchange rates were high in the period between 1995 and 1996, while the lowest exchange rates were between 2002 and 2003. This could be attributed to the regime change in the country's politics, when the NARC government came into power. It has been noted in various ways that the economic indicators in Kenya change immediately after

election, either for bad or for goo based on investors economic behavior and prospects during and after elections.

#### 4.2.4.2 Interest Rate Trends

Figure 4.4 further presents the interest rate trend 1994-2013.

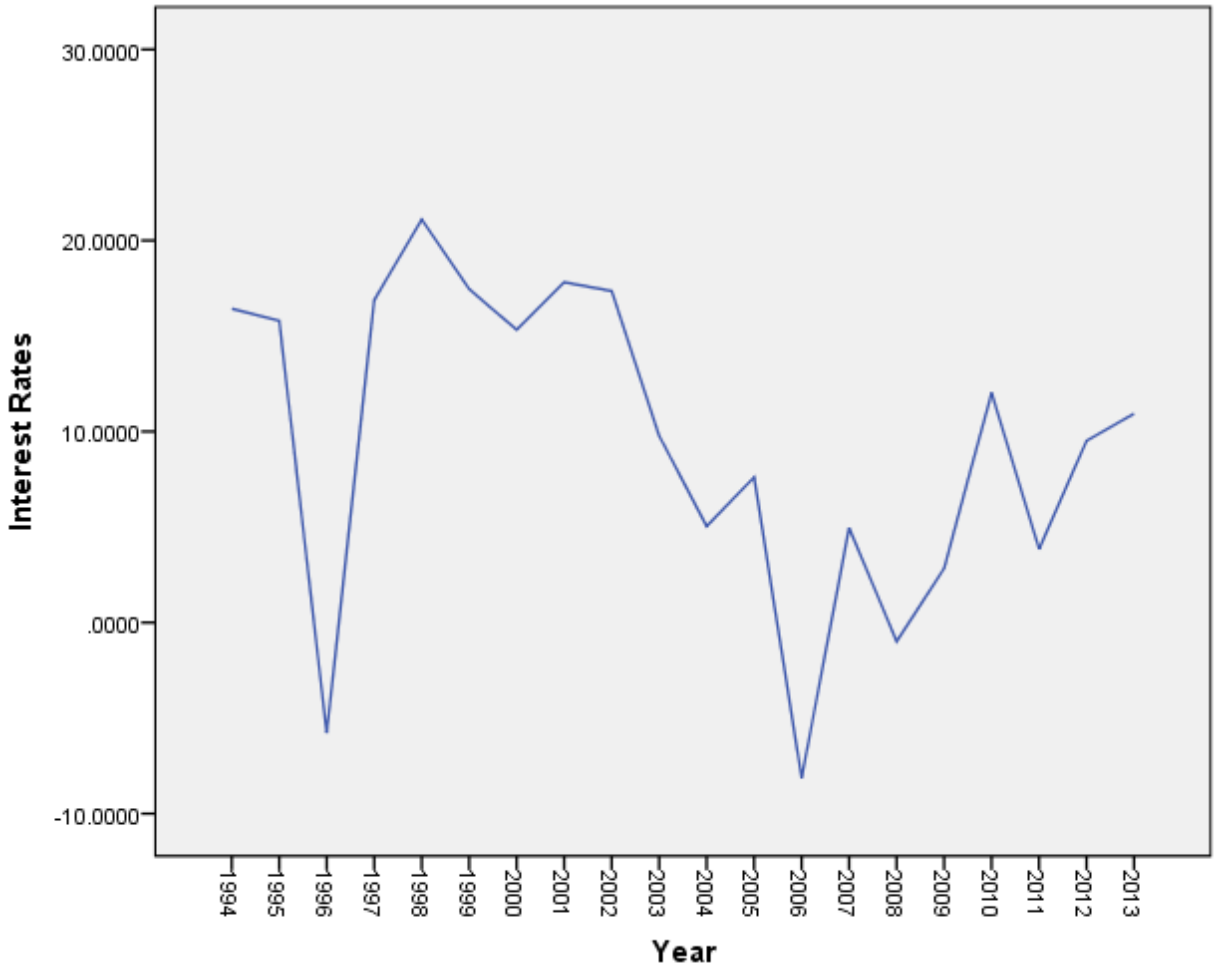



**Figure 4.4: Interest Rate Trends, 1994-2013**

As seen in the figure 4.4 the interest rates in 1996 and 1996 were the second lowest, while in 2006-2007 they were indeed the lowest interest rates. On the other hand the highest interest rates

were in 1998-1999. This could be attributable to the global financial crisis as well as the increase in the government base lending rates.

### 4.3 Summary and Interpretation of the Findings

The study revealed that none of the partial-autocorrelation coefficients are above the critical limit. This indicates the absence of non-stationarity and strongly indicates that there is no need to use first-order differenced transformations of this variable in any regression analysis. The findings agree with Kisaka (2012) who examined the relationship between stock prices and exchange rates in Kenya for the period 1993 and 1999 using monthly data observations of stock price index at NSE. The objective of the study was to identify any causal linkages between foreign exchange rate and stock prices. The study results indicated that the two are non-stationary and they reflect integration of order one. Further test for co-integration proved that the two variables are co-integrated. The study shows that foreign exchange rates affect stock prices.

The study revealed that 45 percent of changes in real exchange rates is as a result of changes in real interest rates. The findings in the study also revealed that the F Value = 14.725and P-value at 0.01 is less than 0.05. These findings agree with Hoffman (2009) who carried out an empirical study on whether real exchange rate and real interest rate relationship is significant. The study focused on proving most macroeconomic models whose empirical support of the relationship showed that the relationship was weak. The study used data drawn from quarterly bilateral U.S. real interest rate differentials and real exchange rates Vis-à-vis other G7 countries. According to Hoffmann (2009), the study provided empirical evidence that real interest rate and exchange rate relationship is economically significant. The study also showed that real interest rate differential can reasonably be used to forecast the expected depreciation rate.

It was also evident that indeed there is a negative significant relationship between real exchange rates and real interest rates with a beta value of -.756 and p value =.001.This implies that indeed interest rates negatively affect the real exchange rates. These findings affirm that indeed it is important to also look at the trend and the relationship of the two rates in other countries. Bautista (2005) carried out a study on the relationship between exchange rate and interest rate differential in six East Asian economies. The study covered the period 1986 to 2004 and used dynamic conditional correlation multivariate model (DCC model). Countries covered included Korea, Malaysia, Philippines, Thailand, Singapore and Indonesia. The study findings showed that the relationship between interest rate differential and exchange rate in the Asian countries changes with a change in nominal regime. The study found that correlations are negative in times of freely falling regimes and positive in times of pegged regimes.The findings are also in agreement with Koranchelian (2005) who carried out an empirical study within the context of Algeria to explore equilibrium in exchange rate in a commodity exporting economy. He found that real oil prices explain Algeria's long-run evolution in equilibrium of real exchange rates and in turn the interest rates in the market. The study findings identified that on average the life of any deviation of rate of exchange from the equilibrium is about nine months. The study concluded that commodity exporting economies do not struggle with foreign exchange fluctuations and their real exchange rate is often in line with equilibrium rate.

The study also revealed that there still exist a negative significant relationship between real interest rates and real exchange rates with a beta -.819 and a p value of .001, when public debt is a controlling variable. The findings agree with Ongeri (2013) who carried out an empirical study with the aim to investigate the determinants of exchange rates and their impact on the performance of commercial banks in Kenya. The study used a descriptive design with primary

data that was collected through self-administered questionnaires. Results from the study findings showed that interest rate and external debt have positive and negative effects on economy's performance while high inflation rate and external debt had negative and significant effects on performance. From the study findings, conclusion was drawn that higher levels of interest rate leads to higher profitability in Kenya's commercial bank. The study by Ongeri (2013) concluded that high levels of inflation rate results in lower banks' profitability in the Kenya market while higher levels of economy's external debt results in lower bank profitability. Recommendations from this study were that the Central Bank of Kenya should enhance banks profitability by setting base lending rates and at the same time not be punitive to the borrowers. Secondly, inflation rate in Kenya should be contained by use of sound policy measures since higher inflation rates hurt the performance of commercial banks in Kenya.

Finally descriptive findings in this study revealed that that the exchange rates were high in the period between 1995 and 1996, while the lowest exchange rates were between 2002 and 2003. This could be attributed to the regime change in the country's politics, when the NARC government came into power. Additionally the interest rates in 1996 and 1996 were the second lowest, while in 2006-2007 they were indeed the lowest interest rates. On the other hand the highest interest rates were in 1998-1999. This could be attributable to the global financial crisis as well as the increase in the government base lending rates. These findings agree with the study by Kiptui and Kipyegon (2008), who identified that Kenya's real exchange rate has in some phases recorded a depreciation of 21% as seen for the period between January 1995 and October 1999. In other phases, the rate has been stable as was the case in the period between October 1999 and December 2004. In the period between 2005 and 2007, the real exchange rate depreciated by 30%.

# CHAPTER FIVE

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.1 Summary

The main objective of this study was to establish the relationship between the real exchange rates and the real interest rates. The study made use of secondary data collected from different sources. The main line of inquiry in this research was limited to floating exchange rate value and real interest rates value for the period between 1994 and 2013. The main sources of data identified for this study included Central Bank of Kenya (CBK), Treasury, International Monetary Fund (IMF) and World Bank. Other sources of secondary data will include scholarly materials. The data used was KES/USD Annualized Average Exchange Rates (Forex), Annualized Average real Interest Rates (provided by World Bank in %), Annualized public debt and Annual Average Economic Inflation Rates (in %) to determine the effects of real interest rate on real exchange rates in Kenya.

The study revealed that none of the partial-autocorrelation coefficients are above the critical limit. This indicates the absence of non-stationarity and strongly indicates no need to use first-order differenced transformations of this variable in any regression analysis. It was also realized that 45 percent of changes in real exchange rates is as a result of changes in real interest rates.

The study further revealed that indeed there is a negative significant relationship between real exchange rates and real interest rates with a beta value of -0.756 and p value =.001. This implies that indeed interest rates negatively affect the real exchange rates. In the same regard it was evident that there still exists a negative significant relationship between real interest rates and real exchange rates with a beta -.819 and a p value of .001, when public debt is a controlling variable. Finally it was evident that the exchange rates were high in the period between 1995 and

1996, while the lowest exchange rates were between 2002 and 2003. This could be attributed to the regime change in the country's politics, when the NARC government came into power. The interest rates in 1996 and 1996 were the second lowest; while in 2006-2007 they were indeed the lowest interest rates. On the other hand the highest interest rates were in 1998-1999. This could be attributable to the global financial crisis as well as the increase in the government base lending rates and the effects of pre and post-election speculations of investors.

### 5.2 Conclusion

The study sought to examine the relationship between real exchange rates and real interest rates in Kenya. The study findings lead to a conclusion that indeed none of the partial-autocorrelation coefficients are above the critical limit for real interest rates and real exchange rates. This indicates the absence of non-stationarity and strongly indicates no need to use of first-order differenced transformations of this variable in any regression analysis.

The study further concludes that indeed there is a negative significant relationship between real exchange rates and real interest rates. This implies that indeed interest rates negatively affect the real exchange rates. In the same regard it was concluded that there still exists a negative significant relationship between real interest rates and real exchange rates when public debt is a controlling variable.

Finally it was concluded that the exchange rates were high in the period between 1995 and 1996, while the lowest exchange rates were between 2002 and 2003. This could be attributed to the regime change in the country's politics, when the NARC government came into power. The interest rates in 1996 and 1996 were the second lowest; while in 2006-2007 they were indeed the lowest interest rates. On the other hand the highest interest rates were in 1998-1999. This could

be attributable to the global financial crisis as well as the increase in the government base lending rates.

### 5.3 Recommendations to Policy and Practice

The study recommends that CBK needs come up with means to evaluate exchange rate volatility. This will help in curbing the impact that exchange rate volatility can have on an economy, and, among other aspects, on inflation and interest rates. This is even more relevant to developing countries, where exchange rate volatility tends to be higher, contributing to a higher exchange rate pass-through to inflation. The higher exchange rate volatility in developing countries, in turn, stems from their greater vulnerability to external shocks and the lower liquidity of their currencies in international markets. There is also need to examine imports and exports trend to arrive at a good trade balance that would not expose the country to high exchange rate volatility.As a result of these two characteristics, the impact of the exchange rate on inflation is greater in developing countries. A second important recommendation is the limitation of controlling exchange rate fluctuations through monetary policies. A first restriction is the weak transmission mechanism of monetary policy in some developing countries like Kenya meaning that the effectiveness of the policy might be only partial. The study recommended that given specific context of developing countries like Kenya, their significant shocks from the exchange rate to inflation and the limitations related to monetary policy, controlling exchange rate volatility is very important in the fight against inflation. Indeed, policy makers would be opting for a more interventionist approach to curb inflation. The fear of floating would in fact be a fear of inflation.

## 5.4 Limitations of Study

The study was faced with some limitations. The study was not conclusive as it did not include some of the other aspects that affect the exchange rate but only concentrated with exchange rate and interest rate. For instance, it factored inflation effect on exchange rate by considering real interest rate (adjusted of inflation), while its important to examine the inflation as a variable factored in the model. The limitations of time constraints and gathering of secondary information were also encountered in the study. This was mainly a challenge because some of the data required visiting the institutions' libraries. There was also the element of confidentiality given that the study focused on a sensitive area of exchange rates. It was expected that some staff from CBK were not willing to offer detailed information on the exchange rate volatility due to the critique and the attention the institution had faced from media and the public as it were going through a transition to acquire a new CBK governor. As such staff would treat their information sharing with caution and mostly would decline to give a forecast of the expected trend. Finally the measurement for data collection was also a challenge given the expected high frequency nature of the data. Whereas it cannot be conclusively said based on this study high interest rates could result to Forex fluctuation in Kenya, there is some link in findings of earlier studies that shows that the results and findings from the study are relevant.

## 5.5 Areas of Further Study

In an increasingly globalizing economy, domestic corporations, their suppliers, and their customers are not insulated from the effects of international economic cycles, currency movements, and global competition. For instance, the foreign exchange fluctuations of oil

marketing companies has not been fully investigated in prior literature and is a good suggestion worth of future research. Also there is need to examine the how the neighbouring economies like Uganda, Tanzania and Ethiopia are handling their exchange rates and their interest structure. In this regard therefore the researcher recommends that additional studies should be conducted on forex fluctuations in the East African region as well as among corporations in Kenya. There is also need to identify and study other macroeconomic factors that affect exchange rates. The study as indicated was not exhaustive of the factors affecting exchange rates in the market and its interrelationship with the factors.

The study suggests that more research be carried out to bring forth more knowledge to the pool of literature on relationship between interest rates and the exchange rates. This is because; very little literature was available to indicate the relationship between the two variables. There is also a need to identify why the data shows that since 2008 to 2013 the interest rates have been increasing, same case to the exchange rates. There must be some factors contributing to this trend that require to be examined, therefore, future researchers should try to bring to book such findings.

## REFERENCES


Alam, S., Butt, S., & Iqbal, A. (2001). The Long-run Relationship between Real Exchange Rate and Real Interest Rate in Asian Countries: An application of Panel Cointegration. *The Pakistan Development Review*, 40(4), 577–602.

Alexius, A. (2001). Uncovered Interest Parity Revisited. *Review of International Economics*, 9(3), 505-517.

Bautista, C. (2005). The exchange rate-interest differential relationship in six East Asian countries. *JEL classification*: F30, F41.

Baxter, M. (1993). Real exchange rates and real interest differentials. *Journal of Monetary Economics*, 33 (1994) 5537, North-Holland.

Bleaney, M. & Laxton, D. (2003). Real Interest rates and real exchange rates: Evidence from Indexed Bonds. The Manchester School, 71(1), 65-77.

Chinn, M., & Meredith, G. (2004). Monetary Policy and Long- Horizon Uncovered Interest Rate Parity. IMF Staff Papers, 51(3), Washington D.C.

Dornbusch, R. (1985). NBER Working Paper Series: Purchasing Power Parity. *Working Paper No. 1591. National Bureau of Economic Research*, Massachusetts: Cambridge.

Engel, C. (2000). Long-Run PPP May Not Hold After All. Journal of International Economics, 51(2), 243–73.

Engel, C. (2011). The Real Exchange Rate, Real Interest Rates, and the Risk Premium. Working Paper 17116. Retrieved on 10/11/2014, from: http://www.nber.org/papers/w17116.

Goldstein, M., Donald, M., Folkerts-Landau, D., Lane, T., Lizondo, J., Rojas-Suárez, L. (1991). Determinants and Systematic Consequences of International Capital Flows. *IMF Occasional Paper 77*. Washington, DC: International Monetary Fund.

Isard, P. (1995). *Exchange Rate Economics.* Cambridge: Cambridge University Press.

Kanamori, T., & Zhao, Z. (2006). The Renminbi Exchange Rate Revaluation: Theory, Practice, and Lessons from Japan. *ADBI policy papers*; No. 9.

Kiptui, M., & Kipyegon, L. (2008). *External Shocks and Real Exchange Rate Movements in Kenya.* Central Bank of Kenya, 13th Annual Conference on Econometric Modelling in Africa to be held at the University of Pretoria, 9-11 July 2008.

Kisaka, S. (2012). The Causal Relationship between Exchange Rates and Stock Prices in Kenya. *Research Journal of Finance and Accounting*, 3(7), 7.

Koranchelian, T. (2005). The Equilibrium Real Exchange Rate in a Commodity Exporting Country: Algeria's Experience. *IMF Working Paper Series, WP/051135*, IMF, Washington DC, 20431, USA.

Krueger, A. (1969). Balance-of-Payments Theory. *Journal of Economic Literature*, 7(1), 1-26.

Maina, I. (2010). *The Study of the Impact of Exchange Rate Variability on Investment in the Electric Power Sub-Sector in Kenya*, Unpublished MBA Project, University of Nairobi.

Musyoki, D., Pokhariyal, G. & Pundo, M (2012). Real Exchange Rate Equilibrium and Misalignment in Kenya. *Journal of Business Studies Quarterly 2012*, 3(4): 24-42.

Ndung'u, N. (2001). *Liberalization of the foreign exchange market in Kenya and short term capital flows problem.* AERC Research Paper No. 109, Nairobi: African Economic Research Consortium.

Ndung'u, N. (2000). *The Exchange Rate and the Interest Rate differential in Kenya: A monetary and Fiscal Dilemma*. KIPPRA Discussion Paper No. 10 Nairobi: Kenya Institute for Public Policy Research and Analysis.

Ndung'u, N. (1991). Adjustment and Liberalization in Kenya. *The Financial journal of International Development*, 11(2), 465-491.

Ngugi, R. (2001). *An empirical analysis of interest rate spread in Kenya.* University of Nairobi, AERC Research Paper 106, African Economic Research Consortium, Nairobi.

Nyachieo, P. (2008). *The impact of changes in foreign exchange rates* on *volume of horticultural exports* in Kenya. Unpublished MBA Dissertation, University of Nairobi.

Nyamute, M. (1998). *Relationship between Stock prices and Exchange Rate, Interest Rates, Money Supply, Inflation Rates*. Unpublished MBA dissertation, University of Nairobi.

Nyamwange, C. (2009). *The Relationship between Real Exchange Rates & International Trade in Kenya.* Unpublished MBA Project, University of Nairobi.

Ongeri, H. (2013). Kenya Influence of Exchange Rate Determinants on the Performance of Commercial Banks in Kenya. *European Journal of Management Science and Economics*, 1(2).

Opati, B. (2009). *A study on causal relationship between inflation and exchange rates in Kenya*. Unpublished MBA thesis, University of Nairobi.

Otuori, O. (2013). Influence of exchange rate determinants on the performance of commercial banks in Kenya. *European Journal of Management Sciences and Economics*, 1(2), 86-98.

Saunders, M., Thornhill, A., Lewis, P., (2007). *Research Methods for Business Students*. Fourth Harlow, England: Pearson Education.

Taylor, A., & Taylor, M., (2004). The Purchasing Power Parity Debate. *Journal of Economic Perspectives,* (18), 135–158.

Were, M., Kamau, A., & Kisinguh, K. (2013). An Empirical Investigation of Exchange Rate Determination in Kenya: Does Current Account Imbalance Play a Role? *Advances in Management and Applied Economics*, 3(2), 165-178.

# APPENDIX

**Sequence Plot**

| | | |
|---|---|---|
| | Confidence Interval Percentage Value | CIN = 95 |
| | Tolerance for Entering Variables in Regression Equations | TOLER = .0001 |
| | Maximum Iterative Parameter Change | CNVERGE = .001 |
| | Method of Calculating Std. Errors for Autocorrelations | ACFSE = IND |
| | Length of Seasonal Period | Unspecified |
| | Variable Whose Values Label Observations in Plots | Unspecified |
| | Equations Include | CONSTANT |

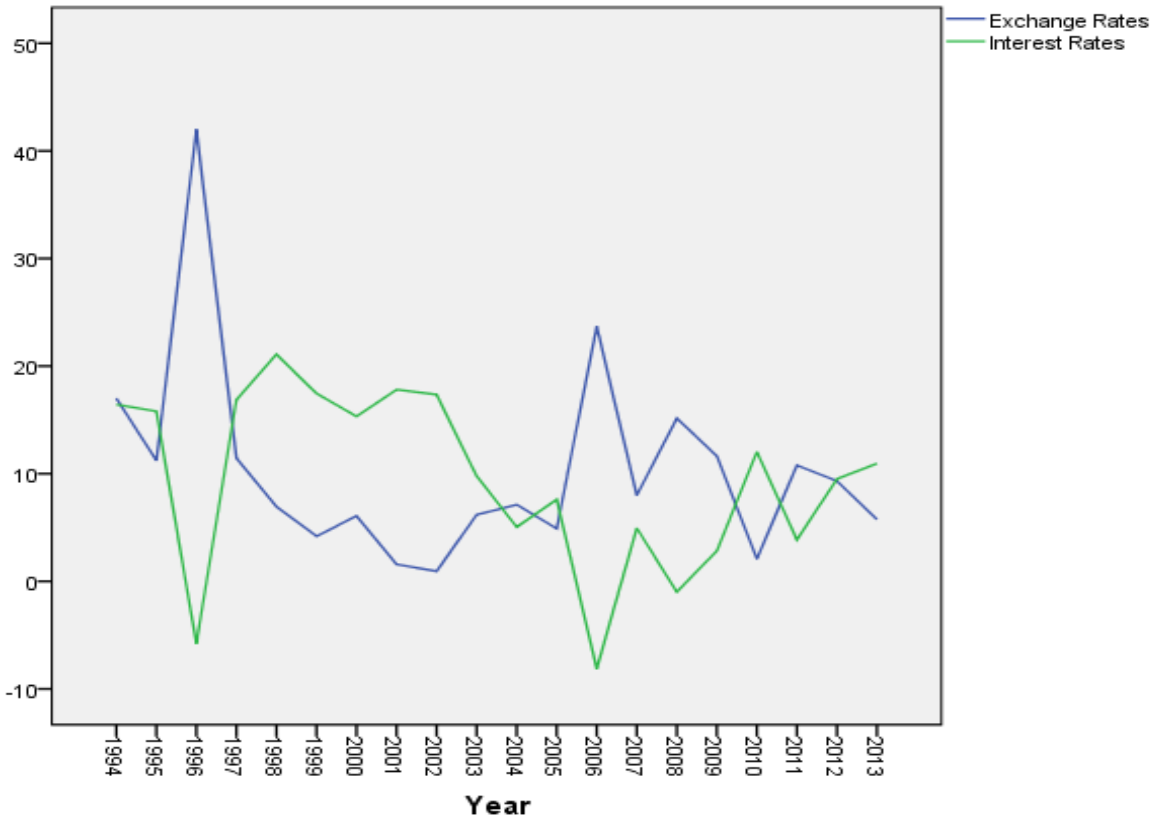
**Model Description**

| | | |
|---|---|---|
| Model Name | | MOD_1 |
| Series or Sequence | 1 | Exchange Rates |
| | 2 | Interest Rates |
| Transformation | | None |
| Non-Seasonal Differencing | | 0 |
| Seasonal Differencing | | 0 |
| Length of Seasonal Period | | No periodicity |
| Horizontal Axis Labels | | Year |
| Intervention Onsets | | None |
| For Each Observation | | Values not joined |

Applying the model specifications from MOD_1

**Case Processing Summary**

| | | Exchange Rates | Interest Rates |
|---|---|---|---|
| Series or Sequence Length | | 20 | 20 |
| Number of Missing Values in the Plot | User-Missing | 0 | 0 |
| | System-Missing | 0 | 0 |



**Model Description**

| | | |
|---|---|---|
| Model Name | | MOD_2 |
| Series Name | 1 | Exchange Rates |
| | 2 | Interest Rates |
| Transformation | | None |
| Non-Seasonal Differencing | | 0 |
| Seasonal Differencing | | 0 |
| Length of Seasonal Period | | No periodicity |
| Maximum Number of Lags | | 15 |
| Process Assumed for Calculating the Standard Errors of the Autocorrelations | | Independence(white noise)[a] |
| Display and Plot | | All lags |

Applying the model specifications from MOD_2

a. Not applicable for calculating the standard errors of the partial autocorrelations.

**Case Processing Summary**

| | | Exchange Rates | Interest Rates |
|---|---|---|---|
| Series Length | | 20 | 20 |
| Number of Missing Values | User-Missing | 0 | 0 |
| | System-Missing | 0 | 0 |
| Number of Valid Values | | 20 | 20 |
| Number of Computable First Lags | | 19 | 19 |

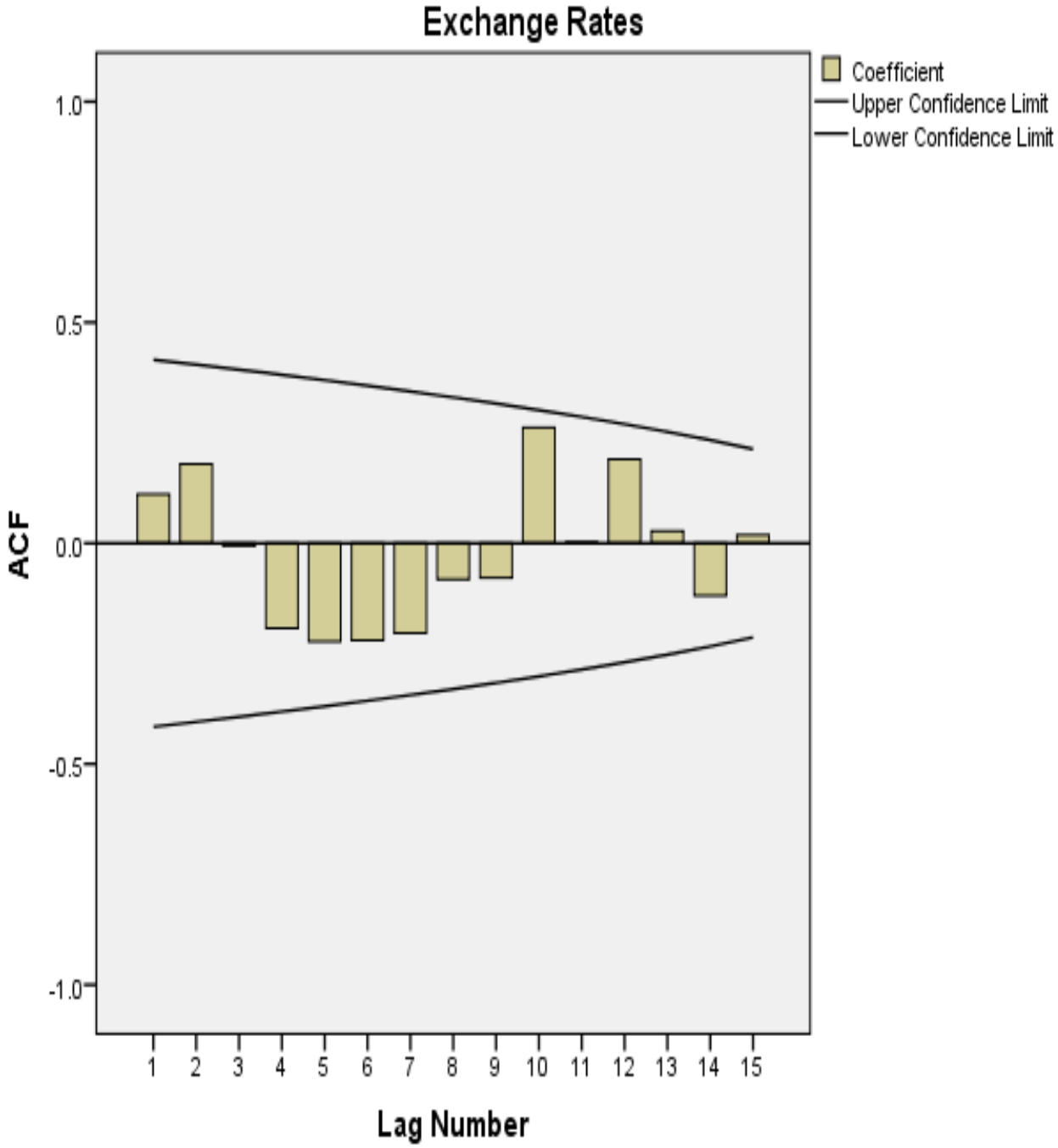
**Exchange Rates: Autocorrelations**

Series: Exchange Rates

| Lag | Autocorrelation | Std. Error[a] | Box-Ljung Statistic | | |
|---|---|---|---|---|---|
| | | | Value | df | Sig.[b] |
| 1 | .111 | .208 | .286 | 1 | .593 |
| 2 | .179 | .202 | 1.071 | 2 | .585 |
| 3 | -.006 | .197 | 1.072 | 3 | .784 |
| 4 | -.193 | .191 | 2.092 | 4 | .719 |
| 5 | -.223 | .185 | 3.546 | 5 | .617 |
| 6 | -.220 | .178 | 5.070 | 6 | .535 |
| 7 | -.203 | .172 | 6.471 | 7 | .486 |
| 8 | -.082 | .165 | 6.716 | 8 | .568 |
| 9 | -.078 | .158 | 6.962 | 9 | .641 |
| 10 | .262 | .151 | 9.987 | 10 | .442 |
| 11 | .002 | .143 | 9.987 | 11 | .532 |
| 12 | .190 | .135 | 11.980 | 12 | .447 |
| 13 | .028 | .126 | 12.029 | 13 | .525 |
| 14 | -.119 | .117 | 13.065 | 14 | .521 |
| 15 | .019 | .107 | 13.097 | 15 | .595 |

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

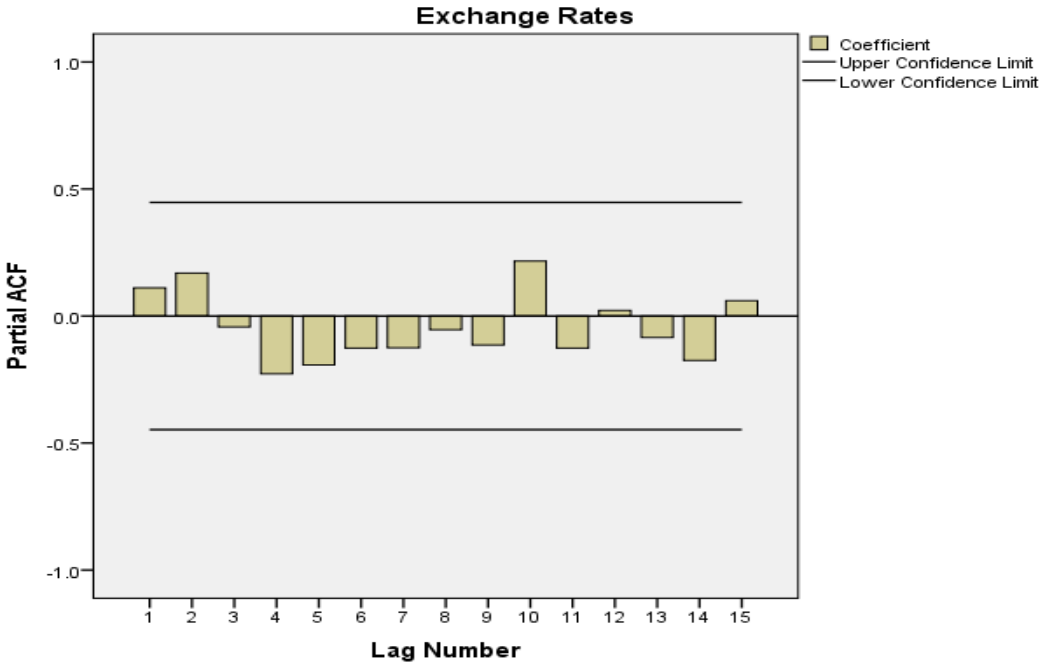

Exchange Rates
Coefficient
Upper Confidence Limit
Lower Confidence Limit
ACF
1.0
0.5
0.0
-0.5
-1.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Lag Number

**Exchange rates**

**Partial Autocorrelations**

Series: Exchange Rates

| Lag | Partial Autocorrelation | Std. Error |
|---|---|---|
| 1 | .111 | .224 |
| 2 | .169 | .224 |
| 3 | -.043 | .224 |
| 4 | -.228 | .224 |
| 5 | -.193 | .224 |
| 6 | -.127 | .224 |
| 7 | -.125 | .224 |
| 8 | -.054 | .224 |
| 9 | -.114 | .224 |
| 10 | .216 | .224 |
| 11 | -.127 | .224 |
| 12 | .022 | .224 |
| 13 | -.084 | .224 |
| 14 | -.175 | .224 |
| 15 | .061 | .224 |



**Autocorrelations**

Series: Interest Rates

| Lag | Autocorrelation | Std. Error[a] | Box-Ljung Statistic | | |
|---|---|---|---|---|---|
| | | | Value | df | Sig.[b] |
| 1 | .296 | .208 | 2.032 | 1 | .154 |
| 2 | .212 | .202 | 3.136 | 2 | .209 |
| 3 | .278 | .197 | 5.141 | 3 | .162 |
| 4 | .035 | .191 | 5.174 | 4 | .270 |
| 5 | -.075 | .185 | 5.338 | 5 | .376 |
| 6 | -.252 | .178 | 7.329 | 6 | .291 |
| 7 | -.200 | .172 | 8.684 | 7 | .276 |
| 8 | -.180 | .165 | 9.866 | 8 | .275 |
| 9 | -.258 | .158 | 12.528 | 9 | .185 |
| 10 | -.010 | .151 | 12.532 | 10 | .251 |
| 11 | -.164 | .143 | 13.842 | 11 | .242 |
| 12 | -.034 | .135 | 13.905 | 12 | .307 |
| 13 | -.026 | .126 | 13.949 | 13 | .377 |
| 14 | -.142 | .117 | 15.434 | 14 | .349 |
| 15 | .057 | .107 | 15.717 | 15 | .401 |

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

**Autocorrelations**

Series: Interest Rates

| Lag | Autocorrelation | Std. Error[a] | Box-Ljung Statistic | | |
|---|---|---|---|---|---|
| | | | Value | df | Sig.[b] |
| 1 | .296 | .208 | 2.032 | 1 | .154 |
| 2 | .212 | .202 | 3.136 | 2 | .209 |
| 3 | .278 | .197 | 5.141 | 3 | .162 |
| 4 | .035 | .191 | 5.174 | 4 | .270 |
| 5 | -.075 | .185 | 5.338 | 5 | .376 |
| 6 | -.252 | .178 | 7.329 | 6 | .291 |
| 7 | -.200 | .172 | 8.684 | 7 | .276 |
| 8 | -.180 | .165 | 9.866 | 8 | .275 |
| 9 | -.258 | .158 | 12.528 | 9 | .185 |
| 10 | -.010 | .151 | 12.532 | 10 | .251 |
| 11 | -.164 | .143 | 13.842 | 11 | .242 |
| 12 | -.034 | .135 | 13.905 | 12 | .307 |
| 13 | -.026 | .126 | 13.949 | 13 | .377 |
| 14 | -.142 | .117 | 15.434 | 14 | .349 |
| 15 | .057 | .107 | 15.717 | 15 | .401 |

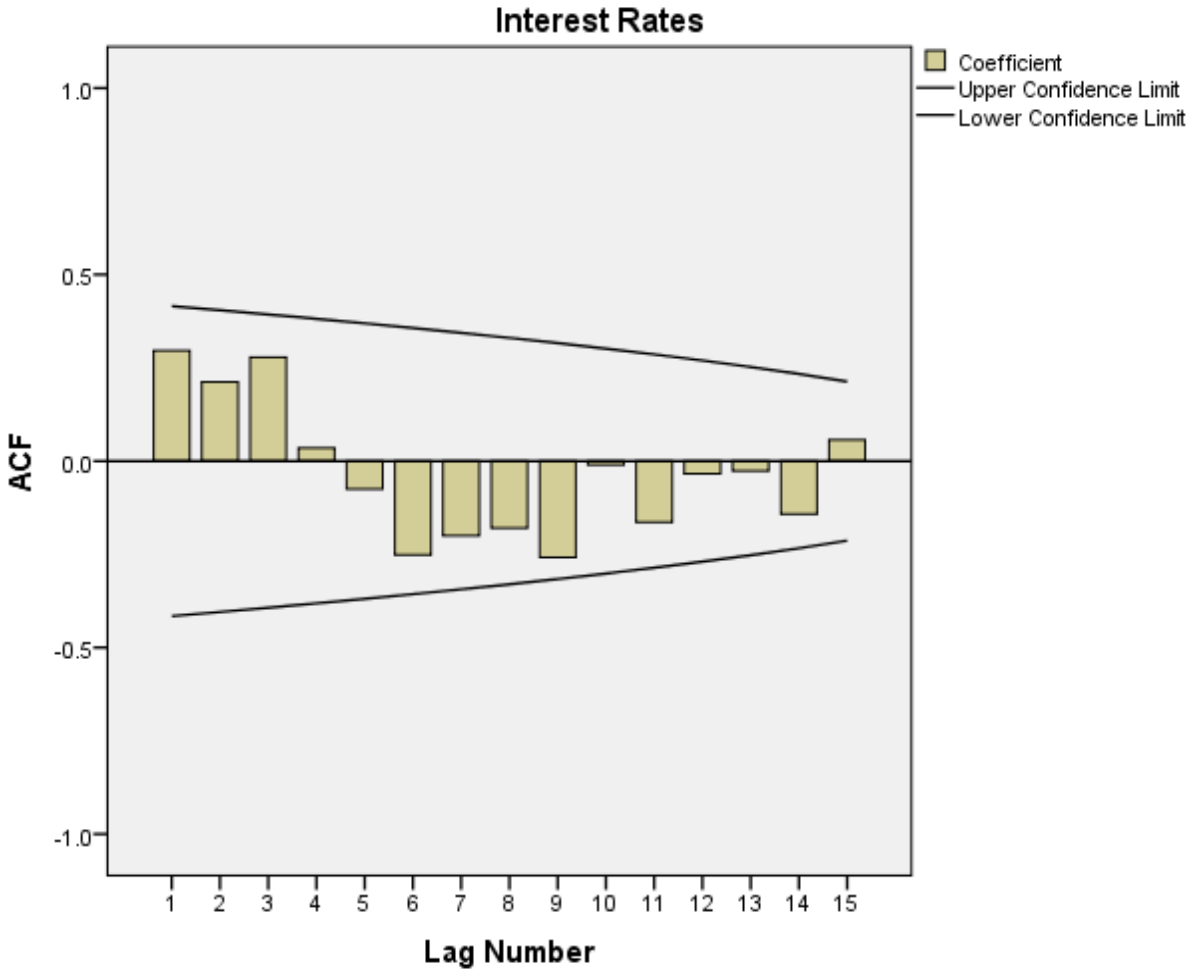
a. The underlying process assumed is independence (white noise).

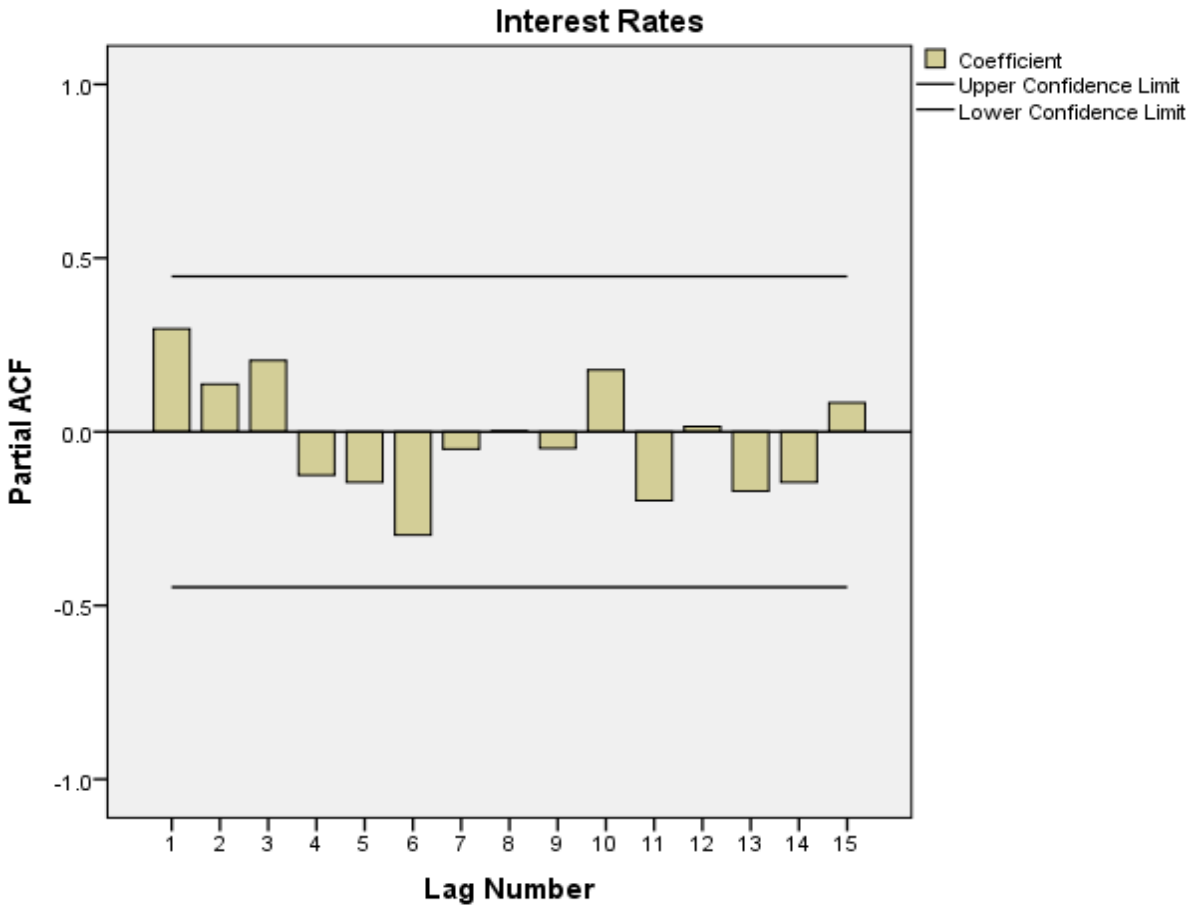
b. Based on the asymptotic chi-square approximation.

**Interest rates**
**Partial Autocorrelations**

Series: Interest Rates

| Lag | Partial Autocorrelation | Std. Error |
|---|---|---|
| 1 | .296 | .224 |
| 2 | .137 | .224 |
| 3 | .205 | .224 |
| 4 | -.125 | .224 |
| 5 | -.145 | .224 |
| 6 | -.297 | .224 |
| 7 | -.050 | .224 |
| 8 | .002 | .224 |
| 9 | -.048 | .224 |
| 10 | .178 | .224 |
| 11 | -.198 | .224 |
| 12 | .015 | .224 |
| 13 | -.170 | .224 |
| 14 | -.145 | .224 |
| 15 | .083 | .224 |


Interest Rates
Coefficient
Upper Confidence Limit
Lower Confidence Limit
ACF
1.0
0.5
0.0
-0.5
-1.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Lag Number


Interest Rates
Coefficient
Upper Confidence Limit
Lower Confidence Limit
Partial ACF
1.0
0.5
0.0
-0.5
-1.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Lag Number

**Variables Entered/Removed**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | Interest Rates[b] | . | Enter |

a. Dependent Variable: Exchange Rates

b. All requested variables entered.

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .671[a] | .450 | .419 | 7.0732738 |

a. Predictors: (Constant), Interest Rates

**ANOVA**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 736.698 | 1 | 736.698 | 14.725 | .001[b] |
| | Residual | 900.562 | 18 | 50.031 | | |
| | Total | 1637.259 | 19 | | | |

a. Dependent Variable: Exchange Rates

b. Predictors: (Constant), Interest Rates

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 17.479 | 2.450 | | 7.135 | .000 |
| | Interest Rates | -.756 | .197 | -.671 | -3.837 | .001 |

a. Dependent Variable: Exchange Rates

**Variables Entered/Removed[a]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | Interest Rates[b] | . | Enter |
| 2 | Public Debt[b] | . | Enter |

a. Dependent Variable: Exchange Rates

b. All requested variables entered.

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .671[a] | .450 | .419 | 7.0732738 | .450 | 14.725 | 1 | 18 | .001 |
| 2 | .709[b] | .502 | .444 | 6.9238410 | .052 | 1.785 | 1 | 17 | .199 |

a. Predictors: (Constant), Interest Rates

b. Predictors: (Constant), Interest Rates, Public Debt

**ANOVA**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 736.698 | 1 | 736.698 | 14.725 | .001[b] |
| | Residual | 900.562 | 18 | 50.031 | | |
| | Total | 1637.259 | 19 | | | |
| 2 | Regression | 822.287 | 2 | 411.143 | 8.576 | .003[c] |
| | Residual | 814.973 | 17 | 47.940 | | |
| | Total | 1637.259 | 19 | | | |

a. Dependent Variable: Exchange Rates

b. Predictors: (Constant), Interest Rates

c. Predictors: (Constant), Interest Rates, Public Debt

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 17.479 | 2.450 | | 7.135 | .000 |
| | Interest Rates | -.756 | .197 | -.671 | -3.837 | .001 |
| 2 | (Constant) | 28.837 | 8.832 | | 3.265 | .005 |
| | Interest Rates | -.819 | .199 | -.726 | -4.124 | .001 |
| | Public Debt | -1.739E-009 | .000 | -.235 | -1.336 | .199 |

a. Dependent Variable: Exchange Rates

**Excluded Variables**

| Model | | Beta In | t | Sig. | Partial Correlation | Collinearity Statistics |
|---|---|---|---|---|---|---|
| | | | | | | Tolerance |
| 1 | Public Debt | -.235[b] | -1.336 | .199 | -.308 | .945 |

a. Dependent Variable: Exchange Rates

b. Predictors in the Model: (Constant), Interest Rates