THE EFFECT OF INTEREST RATE DIFFERENTIAL ON THE FOREIGN EXCHANGE RATE IN EAST AFRICAN FOREX MARKET

BY

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DECLARATION

This Research Project is my original work and has not been submitted for award of a degree at the University of Nairobi or any other University

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SIGNED:..... **DATE:.....**

This research Project has been submitted for examination with my approval as the university supervisor.

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To all mentioned above and those that are not mentioned but contributed in one way or another in the realization of this project I say, THANK YOU.

DEDICATION

This research project is dedicated to my father Michael Gakurui, my mother Mary Waihiga, my wife Joyce Wambui and my son Lemuel Gakurui without whom my academic potential would not have been realized. The support they gave me during my academic life cannot be explained.

ABSTRACT

The study sought to understand the effect of interest rate differential on the foreign exchange rate in the East African forex market. The development of literature was guided by Interest Rate Parity (IPR) Theory and the Purchasing Power Parity (PPP) Theory. The descriptive research design was used in this study. Kenya National Bureau of Statistics (KBA), Central Bank of Kenya, Bank of Tanzania, Bank of Uganda and the IMF e-library were the sources of information in the pursuit to establish the effect of interest rate differential on the foreign exchange rate in East Africa. The study used inflation rates in percentage, interest rates in percentage, consumer price indices, monthly inter-bank rates and monthly current account deficit/surplus from 2009-2014. Multiple linear regression was used to model the relationship between the three explanatory variables and a response variable was used by fitting a linear equation to observed data. Multiple regression analysis was also used to assess whether correlation exists. The study found that more than 51% of the variations in the dependent variables, real interest rate differential, inflation rate and current account deficit/surplus was attributed to other unknown factors. The main predictor variable of our study in the three countries (Kenya, Uganda and Tanzania), real interest rate differential, accounted for less than 10% of the variation in the dependent variable, real exchange rate (RER). As a result the researcher could not be able to find any relationship between real interest rate differential and the real exchange rate and whether the of theories purchasing power parity (PPP) and interest rate parity (IRP) hold for this study. The study further suggested that more research be carried out to bring forth more knowledge to the pool of literature on relationship between real interest rate differential and real exchange rate.

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LIST OF ABRREVIATIONS

AD - Aggregate Demand

ANOVA - Analysis of Variance

AREAER - Annual Report on Exchange Arrangements and Exchange Restrictions

AS - Aggregate Supply

BOT – Bank of Tanzania

BOU – Bank of Uganda

CBK – Central Bank of Kenya

CBS – Central Bureau of Statistics

DCC - Dynamic Conditional Correlation

EAC - East African Community

EMBI - Emerging Market Bond Index

ERC - Economic Recovery Credit -

FX - Foreign Exchange

GARCH - Generalized Autoregressive Conditional Heteroskedasticity

GBP - Great Britain Pound

IMF - International Monetary Fund

IPR - Interest Rate Parity

IRD - Interest Rate Differential

PPP - Purchasing Power Parity

PPP - Purchasing Power Parity theory

RER- real exchange rate

RMSE - root mean square error

SG - Sustained Growth

US - United States of America

USD - United States Dollar

VAR - Vector Autoregressive

Won - The currency of South Korea

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Meese and Rogoff (1983) findings that a comprehensive range of exchange rate models was unable to outperform a random walk, has motivated numerous studies to examine the role of economic fundamentals in explaining exchange rate behaviour. More recently, however, MacDonald and Taylor (1994), Chrystal and MacDonald (1995) and Reinton and Ongena (1999), among others, have found that a series of monetary models can beat a random walk in forecasting performance, at least at long horizons, using a metric like the root mean square error (RMSE) for evaluation. However, although these monetary models have proved somewhat successful in forecasting the exchange rate, they have also encountered some problems. In particular, many of the cointegrating relationships embedded in the models have taken on incorrect signs when compared to theoretical models (McNown & Wallace, 1994).

Dornbusch (1976) and Frankel (1979) contend that a relative rise in domestic interest rates reflects a rise in the domestic real interest rate. On the contrary, Mussa (1976), Frenkel (1976) and Bilson (1978) for example, argue that changes in interest rate differentials reflect changes in expected inflation differentials or expected rate of currency depreciation. Thus, a rise in domestic interest rates indicates an increase in expected inflation. Asset holders will therefore reduce their demand for the domestic currency, hence leading to its depreciation. Thus, the exchange rate and interest rate differential move in the opposite direction. Empirically, evidence on this issue is mixed and inconclusive and hence the motivation for further research in this area. This study

thus investigates the effect of interest rate differential on the exchange rate in the East African forex market in particular Kenya, Uganda and Tanzania.

1.1.1. Interest Rate Differential

This is a differential measuring the gap in interest rates between two similar interest bearing assets. Traders in the foreign exchange market use interest rate differentials (IRD) when pricing forward exchange rates. The Fisher hypothesis states that nominal interest rate differentials between assets that are identical in all respects except for the currency of denomination can be explained by the expected change in the spot exchange rate between those currencies over the holding period (Fisher, 1930). Let S_t be the spot exchange rate at time t, defined as the domestic currency price of foreign currency; let it and if be one-period nominal interest rates at time t on domestic and foreign currency denominated assets, respectively; and let E_t (X) denote the expected value of the variable X, conditional on all the information available at time t. The Fisher hypothesis may then be formally written as:

$$\frac{(1 + i_t)}{(1 + i_t^*)} = \frac{E_t (S_t + 1)}{S_t} \qquad \text{(i)}$$

The interest parity theorem states that short-term capital movements will ensure that the returns on assets that are identical in all respects except for the currency of denomination will be equal when expressed in terms of the same currency after covering the exchange risk in the forward exchange market. This establishes a relationship between nominal interest rate differentials and the forward premium (or discount) on foreign exchange. Let F_t be the one-period forward

exchange rate at time t. The condition for interest parity may then be formally written as:

$$\frac{(1 + i_t)}{(1 + i_t^*)} = \frac{F_t}{S_t} \qquad \text{(ii)}$$

From equations (i) and (ii), it is clear that the Fisher hypothesis and the interest parity theorem are not equivalent unless the forward exchange rate at time t is equal to the expected value at time t of the spot exchange rate that will prevail at time t + 1. That is, both propositions are equivalent only if

$$F_t = E_t(S_{t+1}) \qquad \text{(iii)}$$

There are theoretical reasons that lead us to believe that equation (iii) does not necessarily hold. Several models (Grauer, Litzenberger, & Stehle, 1976; Frankel, 1979; Fama & Farber, 1979; Roll and Solnik, 1979) imply that, under uncertainty, the forward rate is in general different from the expected value of the future spot rate. That difference may be the result of the existence of a risk premium. This premium depends on people's attitudes toward risk and some characteristics of the probability distributions of the variables included in the model.

1.1.2. Foreign Exchange Rate

According to O'Sullivan and Sheffrin (2003), an exchange rate (also known as a foreign-exchange rate, forex rate, FX rate or Agio) between two currencies is the rate at which one

currency will be exchanged for another. It is also regarded as the value of one country's currency in terms of another currency. Exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers where currency trading is continuous. The spot exchange rate refers to the current exchange rate whereas forward exchange rate refers to an exchange rate that is quoted and traded today but for delivery and payment on a specific future date. In the retail currency exchange market, a different buying rate and selling rate will be quoted by money dealers. The buying rate is the rate at which money dealers will buy foreign currency, and the selling rate is the rate at which they will sell the currency. The quoted rates will incorporate an allowance for a dealer's margin (or profit) in trading, or else the margin may be recovered in the form of a "commission" or in some other way. Each country, through varying mechanisms, manages the value of its currency. As part of this function, it determines the exchange rate regime that will apply to its currency. For example, the currency may be free-floating, pegged or fixed, or a hybrid. If a currency is free-floating, its exchange rate is allowed to vary against that of other currencies and is determined by the market forces of supply and demand. Exchange rates for such currencies are likely to change almost constantly as quoted on financial markets, mainly by banks, around the world. A movable or adjustable peg system is a system of fixed exchange rates, but with a provision for the revaluation (usually devaluation) of a currency.

1.1.3. Relationship between Interest Rate Differential and Foreign Exchange Rate

The theoretical as well as empirical relationship between the interest rate differential and exchange rate has been a debatable issue among the economists. In a detailed analysis Gumus

(2002) examined the relationship between exchange rates and interest rates and stressed that raising interest rates support the exchange rates in a crisis. He argued that higher interest rates raise the return that an investor obtains by investing in the country and therefore reduce the capital flight. Also, by increasing interest rates, it can be made very costly for speculators to take short positions in the currency under attack, and therefore speculation may be discouraged. Tight monetary policy can therefore signal the commitment of the monetary authority to defending the currency and be effective in restoring the confidence. These together support the currency and lead to an exchange rate appreciation.

According to Mundell-Fleming model, an increase in interest rate is necessary to stabilize the exchange rate depreciation and to curb the inflationary pressure and thereby helps to avoid many adverse economic consequences. The high interest rate policy is considered important for several reasons. Firstly, it provides the information to the market about the authorities' resolve not to allow the sharp exchange rate movement that the market expects given the state of the economy and thereby reduce the inflationary expectations and prevent the vicious cycle of inflation and exchange rate depreciation. Secondly, it raises the attractiveness of domestic financial assets as a result of which capital inflow takes place and thereby limiting the exchange rate depreciation. Thirdly, it not only reduces the level of domestic aggregate demand but also improves the balance of payment position by reducing the level of imports. Critics argue that the high interest rates imperil the ability of the domestic firms and banks to pay back the external debt and thereby reduce the probability of repayment. As a result, high interest rates lead to capital outflows and thereby depreciation of the currency.

The exchange rate regimes in the East African Market have undergone a significant change during 1990s. Until the late 1990s, exchange rate in the three East African states was fixed by the

monetary authorities. However, it is unlikely to accept the changes in interest rate policy to be purely exogenous to stabilize the exchange rates because the monetary authorities in many countries resort to high interest rates policy when the currency is under pressure and low interest rates policy when the currency is in normalcy. In other words, declines in the value of the exchange rate may themselves prompt monetary authorities to raise domestic interest rates. For example, exchange rates depreciation in Thailand, Malaysia, Indonesia, Korea, and the Philippines during 1997-98 was associated with rising interest rates and vice versa. For example the monetary authorities in Kenya might be using high interest rate policy whenever there is a pressure on the shilling. In other words, exchange rate depreciation may cause the rise in interest rate. Therefore, both the interest rate and exchange rate might be affecting each other.

1.1.4. East African Forex Market

This section provides an overview of the foreign exchange markets in each EAC member country in an effort to gain country-specific insights on financial barriers. In particular, it describes certain financial flow restrictions associated with the foreign exchange market of each member country.

a) Kenya

Kenya's official currency is the Kenya shilling. The foreign exchange market is under the regulation of the Central Bank of Kenya (CBK). The foreign exchange rate policy of Kenya is classified as "managed floating with no predetermined path for the exchange rate" by IMF's 2008 Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). This classification means that, although there is a foreign exchange market in which the exchange rate is determined, there are frequent interventions by the CBK. In addition, the dollar is the principal

intervention currency. Between 1974 and 1981, the movement in the nominal exchange rate in relation to the U.S. dollar was quite erratic with further discrete devaluations. After these devaluations, the exchange rate regime was changed to a crawling peg. This lasted until 1990 when a dual exchange rate system was adopted till October 1993. After a series of devaluations, the official exchange rate was abolished and the shilling was put into a complete float.

Authorized commercial banks and foreign exchange bureaus are licensed to transact in the spot market. There is an interbank (wholesale) spot market and also a retail spot market in which banks and foreign exchange bureaus function as market makers for individuals and businesses. Conditional on approval by the CBK, commercial banks can also enter into forward contracts for foreign exchange. However, foreign exchange bureaus are prohibited from participating in the forward market.

b) Tanzania

Tanzania's official currency is the Tanzania shilling. The foreign exchange market is under the regulation of the Bank of Tanzania (BOT). Similar to that of Kenya, the exchange rate regime of Tanzania is also "managed floating with no predetermined path for the exchange rate." (AREAER, 2008). Prior to April 2007, the exchange rate regime of Tanzania was classified as independently floating, which implies a low level of intervention from the BOT. Yet, given that the foreign exchange market of Tanzania is a shallow one, the BOT had to regularly intervene, which resulted in the reclassification. Throughout the 1970s and the first half of the 1980s, the Tanzanian authorities used trade restrictions and exchange controls to support their development priorities. Exporters of other (nontraditional) goods had to surrender their foreign exchange earnings and similarly, all imports were regulated through administrative allocations of foreign

exchange and an import licensing system, both of which became increasingly restrictive toward the end of the 1970s as foreign exchange reserves declined due to the overvalued exchange rate.

There is an interbank spot market as well as a retail spot market. In addition, authorized dealers (i.e., banks) are allowed to offer forward contracts to their clients on foreign currencies. However, such forward contracts appear to be limited to the hedging activities related to import and export transactions. It is unclear how difficult it is for arbitrageurs and speculators to participate in the forward market, or if such participation is even allowed. At the wholesale level, the BOT does not participate in the forward market in the sense that it does not offer forward cover against exchange rate risks.

c) Uganda

The key factors that have influenced the evolution of the foreign exchange markets in Uganda are different economic and political regimes. The authorities maintained a fixed exchange rate regime and used it to allocate the foreign exchange at rates that could not equilibrate supply and demand, parallel markets in foreign exchange emerged to satisfy the unmet demand from demand from the official channels. The Economic Recovery Program was launched in 1987 and Uganda benefited from substantial financial and technical support from the IMF, World Bank and international community which was directed at macro-economic stabilization and kick-starting production in the economy. Economic Recovery Credit (ERC) supported currency reform that was accompanied by devaluation to address the imbalances in the external sector. Effective July 1989, the government adopted a more active stance when it moved to a *'crawling peg'* exchange rate regime. The official exchange rate was adjusted in line with the inflation

differentials between Uganda and its main trading partners, Kenya, UK and US on a monthly basis.

In July 1990, the Uganda Government took a bold step in the foreign exchange management policy to legalize the parallel market and commission the foreign exchange bureaus. The market determined exchange rate regime was expected to provide a more efficient and reliable mechanism for the allocation of foreign exchange resources. BOU adopted the weighted exchange rate derived from the rates set by inter-bank market as the official rate. Intervention by BOU is mainly to smoothen wide fluctuations in the exchange rate in order to stabilize market conditions. While bureaus are allowed to concentrate on retail spot transactions in instruments such as cash, cheques and bank drafts, banks that are licensed as authorized dealer banks can operate wholesale, retail and forward transactions.

1.2 Research Problem

Ravindran and Soroush (2015) argued that exchange rate fluctuation or stability is the major concern which determines the quantum and direction of foreign trade and commerce. Exchange rate fluctuation and its effect on the volume of international trade is an important subject for empirical investigation, after the adoption of floating exchange rate in 1973. Many well-known exchange rate models highlight the role of the real interest rate differential as a key determinant of real exchange rates. For example, sticky price models (Dornbusch,1976), optimizing models (Grilli & Roubini, 1992) and Obstfeld and Rogo (1996) emphasize the effect of liquidity impulses on real interest rates and consequently the real exchange rate. This relationship is often summarized in the form of the real exchange rate - real interest rate (RER) relationship.

However, despite its centrality to many open economy macro models, the empirical evidence on the RER relationship is rather mixed.

According to Hnatkovska, Lahiri and Vegh (2007) the relationship between interest rates and exchange rates has long been a key focus of international economics. Most standard theoretical models of exchange rates predict that exchange rates are determined by economic fundamentals, one of which is the interest rate differential between home and abroad. However, a consistent result in the empirical literature is that a random-walk exchange rate forecasting model usually outperforms fundamental-based forecasting models. In other words, most models don't explain exchange rates movements (Meese,1990). Moreover, studies which have directly examined the relationship between interest rates and exchange rates have typically found mixed/conflicting results. Thus, Eichenbaum and Evans (1995) find that for the G7 countries interest rate innovations tend to appreciate the currency. On the other hand, Calvo and Reinhart (2002) find that for developing countries there is no systematic relationship between the two variables.

According to Stotsky, Ghazanchyan, Adedeji & Maehle (2012 the record on economic growth is central to assessing macroeconomic performance in the East African region. In developing countries, the foreign exchange regime and real exchange rate may play a crucial role in determining growth. Their study found no robust relationship between the choice of the foreign exchange regime and growth (both overall and non-agricultural growth), a finding that is generally in accord with previous studies on developing countries (Lungu & Sheefani, 2013). There was, however, a positive correlation between the more flexible foreign exchange regimes and growth.

The major problem relating to the East African region is how to achieve macro-economic stability (Davoodi, 2012) by devising policy frameworks that result in sustainable economic growth. Initiating and sustaining high growth is an objective of the East African Community (EAC) which identified key determinants and benchmarking growth performance indexes against a group of countries that had either sustained high growth (SG) or accelerated growth without necessarily sustaining it for long (non-SGs). High growth is accompanied by: (i) low inflation; (ii) high investment and savings rates; (iii) improved fiscal discipline through low fiscal deficits and low external debt; (iv) higher export-oriented growth with improved current account balances, helped by depreciating real exchange rates; and (v) better governance, institutions, and conducive business climates that encourage foreign direct investment. The study of the effect of interest rate differential on foreign exchange rate in East African forex market is therefore important since it contributes to macroeconomic stability. How far can exchange rate appreciate or depreciate due to fluctuation in interest rates?

1.3 Research Objectives

The main objective of this study is to establish the effect of interest rate differential on the foreign exchange rate in East African forex market.

The study also seeks;

i. To establish whether interest rate parity model holds.

ii. To establish whether the purchasing power parity model holds.

1.4 Value of Study

The study will be of benefit to commercial banks, economic planners, forex bureaus, exporters, importers in hedging their foreign exchange exposures among other relevant users of interest rates and exchange rates. The information acquired, recommendations and conclusions that were made later in the study will help those bodies that depend on the interest rates and exchange rates to make better and informed decision on the exchange rate matters.

The study will also be of the following practical value: prediction of exchange rate in advance using the model. This will help policy makers in the East African States in their economic planning as well other players in the foreign exchange market. The study will also be of the following theoretical value: the application of the purchasing power parity to establish long run relationship between interest rate differential and real exchange rate in the East African economies.

Finally, the future researcher who will carry out a similar study will benefit from the study and they will know more about the effect of interest rate differential on foreign exchange rate and come up with a different study to give more information as would be necessary in relation to the topic.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter initially explores the theories that attempt to explain the relationship between interest rate differential and exchange rate. Empirical evidence of the studies is then tabled. Approaches to testing the relationship are also explored and finally a summary of the literature review is then discussed.

2.2 The Basic Theoretical Frameworks

Many theories have been written in respect to the main determinant of future exchange rates. Although the majority of these theories give adequate reasons in order to explain what actually determines the rates between the currencies, we can argue that there are many factors that may cause a currency fluctuation. Consequently, there is little that can be alleged in respect to the theory that better answers the question of what finally determines the exchange rates.

2.2.1 Purchasing Power parity Theory

It is also known as the Inflation Rate Differential. Purchasing power of parity (PPP) developed by Cassel (1918), states that in ideally efficient markets, identical goods should have one price. It expresses the idea that a bundle of goods in one country should cost the same in another country after exchange rates are taken into account. The foreign exchange market is considered to be in equilibrium when the deposits of all the currencies provide equal rate of return that was

expected. Economist has been criticized this by arguing that it does not consider transaction cost, transport cost and official trade barriers.

2.2.2 Interest Rate Parity Theory

It is also known as the International Fisher Effect and developed by Fisher (1930). Interest Rate Parity (IPR) theory is used to analyze the relationship between the spot rate and a corresponding forward (future) rate of currencies. The IPR theory states interest rate differentials between two different currencies will be reflected in the premium or discount for the forward exchange rate on the foreign currency if there is no arbitrage the activity of buying shares or currency in one financial market and selling it at a profit in another. The theory further states size of the forward premium or discount on a foreign currency should be equal to the interest rate differentials between the countries in comparison (Bleaney & Fielding, 2000).

The theory of interest rate parity, relates the difference between foreign and domestic interest rates with the difference in spot and future exchange rates. This parity condition states that the domestic interest rate should equal to the foreign interest rate plus the expected change of the exchange rates. If investors are risk-neutral and have rational expectations, the future exchange rate should perfectly adjust given the present interest-rate differential. For example, if the differential between one-year dollar and pound interest rates is five percent with the pound being higher, risk neutral, rational investors would expect the pound to depreciate by five percent over one year thereby equalizing the returns on dollar and pound deposits. If the exchange rate did not adjust, then arbitrage opportunities would exist. Consequently, the current forward rate should reflect this interest rate differential as a forward contract locks in the future exchange rate.

2.3 Determinants of Exchange Rates

Exchange rates are determined by the demand and supply of a particular currency as compared to other currencies. There are numerous factors that determine the exchange rate between two countries.

2.3.1 Interest Rates

Inflation and interest rates are highly correlated. Higher inflation generally means higher interest rates in an economy. Hence, high interest rate also becomes a factor for the changes in exchange rate. Interest rate is the tool used by the central bank of a country to keep a check on any major currency fluctuation. The central bank can also try to keep the exchange rate under a targeted range by manipulating the interest rates. Higher interest rates bring in more investment from overseas as the returns are higher than countries with low interest rates (Bowe & Saltvedt, 2004).

The theoretical as well as empirical relationship between the interest rate and exchange rate has been a debatable issue among the economists. According to Mundell-Fleming model, an increase in interest rate is necessary to stabilize the exchange rate depreciation and to curb the inflationary pressure and thereby helps to avoid many adverse economic consequences (Calvo & Reinhart, 2002). The high interest rate policy is considered important for several reasons. Firstly, it provides the information to the market about the authorities' resolve not to allow the sharp exchange rate movement that the market expects given the state of the economy and thereby reduce the inflationary expectations and prevent the vicious cycle of inflation and exchange rate depreciation. Secondly, it raises the attractiveness of domestic financial assets as a result of which capital inflow takes place and thereby limiting the exchange rate depreciation. Thirdly, it

not only reduces the level of domestic aggregate demand but also improves the balance of payment position by reducing the level of imports (Devereux & Engel, 2003).

The three major explanations of inflation include fiscal, monetary, and balance of payments aspects. While in the monetary aspect inflation is considered to be due to an increase in money supply, in the fiscal aspect, budget deficits are the fundamental cause of inflation in countries with prolonged high inflation. However, the fiscal aspect is closely linked to monetary explanations of inflation since government deficits are often financed by money creation in developing countries. In the balance of payments aspect, emphasis is placed on the exchange rate. Simply, the exchange rate collapses bring about inflation either through higher import prices and increase in inflationary expectations which are often accommodated or through an accelerated wage indexation mechanism (McCallum & Nelson, 2000).

2.3.2 Inflation

Inflation is one of the major factors that affect the exchange rate. Theoretically a low inflation rate scenario will exhibit a rising currency rate, as the purchasing power of the currency will increase as compared to other currencies (Duarte & Stockman, 2002). Generally, the inflation rate is used to measure the price stability in the economy. Conceptually, the inflation can be divided into two sides, namely: demand side inflation (demand pull inflation) and supply side inflation (cost push inflation). For open-economy countries, inflation comes from domestic factors (internal pressure) and also overseas factors (external pressure) (Edwards, 2002). The sources of external factors are the increase in the world commodity prices or exchange rate fluctuation. The influence of exchange rate towards inflation itself depends on the choice of exchange rate regime in the country. Exchange rate system has an important role in reducing or minimizing the risk of fluctuations in exchange rates, which will have an impact on the

economy. Any changes in exchange rates will have a great impact on the economy (Eichengreen, 2004).

According to Engle (2002) in the system of floating exchange rates, exchange rate fluctuations can have a strong impact on the level of prices through the aggregate demand (AD) and aggregate supply (AS). On the aggregate supply, depreciation (devaluation) of domestic currency can affect the price level directly through imported goods that domestic consumers pay. However, this condition occurs if the country is the recipient countries of international prices (international price taker). Non direct influence from the depreciation (devaluation) of currency against the price level of a country can be seen from the price of capital goods (intermediate goods) imported by the manufacturer as an input. The weakening of exchange rate will cause the price of inputs more expensive, thus contributing to a higher cost of production.

Inflation is the term used to describe a rise of average prices through the economy. It means that money is losing its value. The underlying cause is usually that too much money is available to purchase too few goods and services, or that demand in the economy is outpacing supply. In general, this situation occurs when an economy is so buoyant that there are widespread shortages of labour and materials. People can charge higher prices for the same goods or services. Inflation can also be caused by a rise in the prices of imported commodities, such as oil. However, this sort of inflation is usually transient, and less crucial than the structural inflation caused by an over-supply of money (Fraga, Goldfajn & Minella, 2003).

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external factors are the increase in the world commodity prices or exchange rate fluctuation. The influence of exchange rate towards inflation itself depends on the choice of exchange rate regime in the country. Exchange rate system has an important role in reducing or minimizing the risk of fluctuations in exchange rates, which will have an impact on the economy. Any changes in exchange rates will have a great impact on the economy (Fung, 2002).

Accordion to Gerlach and Smets, (2000) Inflation can be very damaging for a number of reasons. First, people may be left worse off if prices rise faster than their incomes. Second, inflation can reduce the value of an investment if the returns prove insufficient to compensate them for inflation. Third, since bouts of inflation often go hand in hand with an overheated economy, they can accentuate boom-bust cycles in the economy. Sustained inflation also has longer-term effects. If money is losing its value, businesses and investors are less likely to make long-term contracts. This discourages long-term investment in the nation‘s productive capacity. The relationship between inflation targeting regime and exchange rate regime has led some analysts to conclude that one of the costs of inflation targeting adoption is the increase in exchange rate volatility. Yet, some studies show that the adoption of a free-floating exchange rate does not necessarily implies more effective of nominal and real exchange rate floating argue that inflation targeting would lead to higher exchange rate volatility find that the lack of credibility of monetary authority may lead to exchange rate volatility problem (Levy-Yeyati & Sturzenegger, 2002). Understanding the sources of fluctuations in output and inflation is an important challenge to empirical macroeconomists. It is an issue taken up in a large number of recent studies in the developed nations, Latin America, and Asian countries. At the core of this issue is whether or not stabilization without recession is possible. While some theoretical models suggest that

stabilization could be expansionary particularly for high inflation countries, others argue that stabilization without recession is rather difficult to achieve (Ma´ckowiak, 2003).

2.3.3 Current Account Deficits

The current account is the balance of trade between two countries. It reflects all payments and receipts between the two countries for goods, services, interests and dividends. A negative balance of payment or a deficit in the current account shows that the country is importing or spending more on foreign trade than it is exporting or earning from abroad. This means that the country requires more foreign currency than it receives from its exports. This excess demand for foreign currency lowers the country‘s exchange rate (Taylor, 2001). A good example of this is the deficit balance of payment between US and China. Ideally, due to this increasing deficit in the balance of payment the Dollar should depreciate against the Yuan, however the Chinese government is artificially keeping the exchange rate of Yuan fixed in order to keep its goods cheaper. This kind of fixed exchange rate is called Pegged rate (Svensson, 2000).

2.3.4 Unemployment Rate

The unemployment rate is another factor that can influence the exchange rate. A relation that can reveal a connection between the unemployment rate and the exchange rate is given by the number of available workplaces. If the number of available workplaces is consistent, then this represents a signal of the economic growth, thus the companies need to hire more personnel to handle the consumer needs (Shambaugh, 2004).

2.4 Empirical Studies

Most Eastern African countries have notably improved their macroeconomic performance in recent years, as reflected in higher average growth, generally moderate and stable inflation, and

the accumulation of ample international reserve coverage (Stotsky, Ghazanchyan, Adedeji & Maehle, 2012). Key contributing factors to this improved performance were the reforms that these countries undertook to strengthen macroeconomic stability, and to liberalize their foreign exchange regimes. In the past, the foreign exchange regimes of Kenya, Uganda and Tanzania shared features of illiberal regimes once found commonly in Latin America and elsewhere, and were characterized by administrative controls over foreign exchange allocation and current account transactions. Persistently weak external accounts and overvalued exchange rates led to extensive foreign exchange rationing and sizeable black market premiums. A growing body of literature tries to explain the effect of interest rate on exchange by various researchers.

Baxter (1993) investigated the link between real exchange rate and real interest rate differentials over the floating rate period of 1975 – 1992 in US, France, Germany, Japan, Switzerland and the UK. In contrast to earlier econometric studies, he found evidence of a relationship, with strongest link at trend and business-cycle frequencies. He employed both univariate and multivariate approaches to decomposing time series into permanent and temporary components. Because prior studies focused on high-frequency components of the data, they found no statistical link between real exchange rates and real interest differentials.

Kraay (1998) has examined whether an increase in interest rate policy can defend the speculative attack by using monthly data for 54 industrial and middle-income countries over the period 1975-1999 and found that the high interest rates policy do not defend the currencies against speculative attacks. He used a non-linear regression model on the variables and therefore, concluded that there is a striking lack of any systematic association between interest rates and the outcome of speculative attack.

Simone and Razzak (1999) re-examined the unsettled theoretical and empirical issues regarding the relationship between nominal exchange rates and interest rate differentials and provided a model for the behavior of exchange rates in the long-run, where interest rates are determined in the bond market. The model predicts that an increase in the interest rate differential appreciates the home currency. The model was tested for the U.S. dollar against the Deutsche mark, the British pound, the Japanese yen, and the Canadian dollar. The first two pairs of exchange rates, for which purchasing power parity seems to hold, display a strong relationship with interest rate differentials.

Goldfajn and Baig (1999) studied the linkage between real interest rate and real exchange rate for the Asian countries during July 1997 to July 1998 by using Vector Auto Regression (VAR) based on the impulse response function from the daily interest rates and exchange rates. They did not find any strong conclusion regarding the relationship between interest rate and exchange rate.

Gumus (2002) evaluated the relationship between interest rates and exchange rates during the 1994 currency crisis in Turkey in order to explain whether high interest rates had the effect of appreciating the nominal exchange rates. Using weekly data and applying a vector error-correction model, it is found that raising interest rates had the significant long-run effect of depreciating the nominal exchange rates in contrast with the conventional wisdom.

Patra (2004) studied the log-run relationship between real exchange rate and real interest rate differentials using the cointegration approach between India and US for the period 1993 – 2003. It employed both Engle-Granger and Johansen tests for presence of cointegration. The model studied in this paper, as one would expect, suggests that there is good reason to believe that there should be a systematic relationship between the two variables. However, similar to some other

researchers, he could not find a good empirical representation that is supported by the data and hence empirical support in favour of the above relationship. The result is robust for different measures of real interest rate differentials.

Bautista (2005) examined the relationship between exchange rate and interest rate differential in six East Asia countries by tracking the correlation of the real exchange rate and the real interest differential from 1986 to 2004 and noting the shifts in the nominal exchange rate regime. The analysis makes use of the dynamic conditional correlation multivariate GARCH model (DCC model henceforth) developed by Engle (2002). For each country, a DCC model is estimated to determine the correlation of the two variables over time. These countries are Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand. Positive time-varying correlations characterized the relation during pegged regimes. Correlations are negative during freely falling regimes.

Bjornland and Hungnes (2006) examined the forecasting performance of a structural exchange rate model that combines the purchasing power parity condition with the interest rate differential in the long run, with some alternative exchange rate models. The analysis is applied to the Norwegian exchange rate using the Johansen Model (1988). The long-run equilibrium relationship is embedded in a parsimonious representation for the exchange rate. The structural exchange rate representation is stable over the sample and outperforms a random walk in an out-of-sample forecasting exercise at one to four horizons. Ignoring the interest rate differential in the long run, however, the structural model no longer outperforms a random walk.

Hnatkovska and Lahiri (2007) investigated the non-monotonic relationship between interest rates and exchange rates. They found that empirical literature in this area, however, has been unable to detect a clear systematic relationship between interest rates and exchange rates. They used an optimizing model of a small open economy to rationalize the mixed empirical findings. The model had three key margins. First, higher domestic interest rates raise the deposit rate. This increases the demand for deposits and hence raises the money base. Secondly, firms need bank loans to finance the wage bill, which reduces output when domestic interest rates increase. Lastly, higher interest rates raise the government's fiscal burden. This negative fiscal effect raises the expected inflation. They found that increases in the interest rate up to 35% both appreciate the currency and induce a fall in the rate of currency depreciation. However, more aggressive increases in the domestic interest rate both depreciate the currency as well as increase the rate of currency depreciation. The results provided an explanation for the inability of non-structural empirical models to find a systematic relationship.

Park (2011) extended the studies of Meese and Rogoff (1998) and others to find a stable long-run relationship between real exchange rates and real interest rates differentials using Korean Won/US Dollar data for the period of 1991~2011 containing the East Asian financial crisis. Applying error correction model to two sub-periods before and after the crisis, he identified a reliable relationship between the two variables with the addition of foreign exchange reserves for the post-crisis period but not for the pre-crisis period. The estimate of the coefficient on the real interest rates differential is significant but positive unlike the prediction of conventional interest rate parity theory. However, the sign is negative and significant on the lagged real interest

differential. Korean foreign exchange reserve is estimated to have a negative significant effect on the Won/USD real exchange rate.

Ndung'u (2000) researched on the relationship between the real exchange rate and the real interest rate differential on one hand and the implications they have on portfolio capital flows on the other. Since the high-frequency data used is likely to be noisy, the model is re-estimated in a technique that uses time-varying parameters (the Kalman filter) for comparison. The paper showed that closing the gap in the real interest rate differential (that is, lowering the domestic interest rate) will be consistent with a depreciation of the exchange rate. The optimal approach is not to sterilize these capital flows but to allow exchange rate movements to stabilize them in the medium to long term.

Alun (2012) showed that all of the exchange rates of sub-Saharan Africa countries with flexible exchange rate regimes i.e. Nigeria, Ghana, Tanzania, Kenya, Uganda and Zambia responded significantly to changes in the EMBI (Emerging Market Bond Index) spread in recent years and most responded to changes in the US Treasury bill rate. He used the Macdonald (2000) exchange rate determination model that combines interest rate and purchasing power parity conditions, assuming no exchange rate intervention. These results contrast with a widely held view that financial markets in sub-Saharan Africa are closed and do not respond to changes in financial market instruments in developed countries. The South Africa rand appreciated considerably when the US interest rate rises whereas the exchange rates of countries that have fairly closed capital accounts depreciate significantly. This different response is likely related to the speed at which portfolio flows adjust in various countries to changes in foreign interest rates. Finally, the

paper provides no support for the interest rate parity theory because domestic interest rates have no bearing on exchange rate movements.

Mbogo (2006) constructed an econometric model to analyze the exchange rate dynamics of the emerging market economy of Tanzania. This study provided a basis for comparing alternative options in regard to determining exchange rate dynamics and hence determining the foreign exchange rate risk. The model developed, and the policy implications derived from it, provides important guidelines for Tanzanian policy makers, as the results suggest that Tanzania would benefit from the effects of monetary and external trade policies reform. This study not only provides a framework for determining and forecasting nominal exchange rate dynamics for the emerging market economy of Tanzania, but is also applicable to other emerging market economies in Africa, including member states of East African Community, which also have been experiencing the same economic evolution.

Lungu and Sheefani (2013) investigated the relationship between the exchange rate and the interest rate for Namibia using time series techniques such as unit root tests, cointegration test, impulse response and variance decomposition. The study used quarterly data for the period 1993. The results for cointegration show that there is no cointegration among the variables. The empirical results of this study were unable to detect a clear systematic relationship between interest rates and exchange rates. However, the variance decomposition further revealed that the errors in the forecast of both the exchange rate and interest rate are dominated by itself and an insignificant percentage is also attributed to other variables.

Mbaya (2013) conducted a research in Kenya and sought to establish the effect of interest rate in stabilizing exchange rates. Longitudinal correlation design was adopted and regression analysis was run on multivariate equations to establish the relationship between the variables in determining the exchange rate of USD, GBP and Euro. The findings of the study reveal that not only interest rates have a positive relationship with exchange rate but also money supply has a strong significant effect on exchange rates.

Nduri (2013) sought to understand the effects of interest rate and inflation rate on exchange rates in Kenya. There are many factors that affect the exchange rate in Kenya and elsewhere in the world, but the study keenly was interested in understanding the relationship between interest rates and inflation rates on exchange rate in Kenya. Multiple linear regression was used to model the relationship between two explanatory variables and a response variable was used by fitting a linear equation to observed data. Multiple regression analysis was also used to assess whether confounding exists. The study finally concluded that increase in interest rate is necessary to stabilize the exchange rate depreciation and to curb the inflationary pressure and thereby helps to avoid much adverse economic consequence. The study recommended that regulators should come up with means to evaluate exchange rate volatility. It was further recommended that given specific context of developing countries like Kenya, of 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.

2.5 Summary of Literature Review

The theoretical and empirical literature proves that there exists a relationship between interest rates and exchange rates. This conclusion is not definite because of the mixed finding for

instance some studies have found that there exists a negative relationship (Park, 2011) and positive relationship (Mbaya, 2013) in the long-run but also money supply has a strong significant effect on exchange rates. The economic theory postulates a negative relationship between these variables, this gap forms the basis for this study. Further, studies have contended a negative relationship exists in the two variables for developing economies (Furman & Stiglitz, 1998) while a positive relationship exhibits for the G10 countries. Other factors that may contribute to the mixed results are the exchange rate regime (Bautista, 2005) which characterized a negative relationship during fixed exchange rate regime and a positive relationship during freely falling regimes. Studies conducted in South Africa (Alun, 2012) showed no evidence to support the interest rate parity theory because domestic interest rates did not have a bearing on exchange rate movements. Lungu and Sheefani (2013) were unable to detect a clear and systematic relationship between the variables in Namibia. The lack of empirical consistence has motivated my further research in this field and more so due to the impact of these two macro-economic variables to bolster economic growth. Further, there has not been any research conducted in the East African region on the effect of interest rate differential on the exchange rates of Kenya, Uganda and Tanzania.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section looks at the methodology that was adopted, outlines research design, target population and sample, method of collecting data and lastly data analysis technique.

3.2 Research Design

This study was descriptive in nature. Descriptive research design is suitable for the need to describe the effect of interest rate differential on foreign exchange rate in East African forex market. Descriptive studies are statistical studies that identify patterns or trends in a situation, group or individuals. Descriptive analysis is largely the study of distributions of one variable (Kothari, 2004). Its purpose was to portray the state of affairs as it was. A research design helps researchers to lay out the research questions, methodologies, implementation procedures, and data collection and analysis for the conduct of a research project. Generally there are three types of research design: quantitative design, qualitative design, and mixed methods design Nduri (2013). In this study the researcher used quantitative research design which includes the descriptive research design. The study described the major variables associated with foreign exchange rate in East African forex market.

3.3 Target Population

This study employed a descriptive study of CBK, BOU, BOT, Central Bureau of Statistics, IMF and the Federal Reserve Bank. The study relied on secondary data that was obtained from the population.

3.4 Data Collection Techniques

Time series secondary data was used in this study. The researcher used the monthly data for nominal exchange rates and consumer price index from IMF eLibrary, 91-day and 10-15 year treasury bond rates. The latter formed the basis for computation of the interest rate differential in domestic and foreign interest rates. Nominal exchange rates and nominal interest rates were then converted into real exchange rates and real interest rates using consumer price indices of the corresponding countries. The real rate of interest is the difference between nominal interest rate and inflation rate. The consolidated data on the average buy and sell foreign exchange rates and interest rates were collected by the researcher electronically from the Central Bank of Kenya, Bank of Tanzania, Bank of Uganda, Central Bureau of Statistics, IMF eLibrary and the US Federal Reserve System. Secondary data on a monthly basis covering the period January 2009 and July 2014 was used in the estimations.

3.5 Data Analysis Techniques

Data was analyzed using quantitative method; the data was then presented using various statistical tools such as tables, percentages and graphs. The study used multiple linear regression formula to get the effect of interest rate differential on exchange rate. Multiple linear regression formular was used to model the relationship between two or more explanatory variables and a response variable by fitting a linear equation to observed data.

3.5.1 Econometric Model

This study investigates three important macroeconomic variables' relationship and their effect on foreign exchange rates. Regression modeling technique is widely applied to estimate coefficients for independent variables, to test hypotheses and to evaluate the importance of each independent

variable in the model. Multiple linear regression analysis was used to estimate the association between the dependent variable and the independent variable of the study holding all other variables constant, and also to assess whether confounding exists. It provided a way of adjusting for (or accounting for) potentially confounding variables that have been included in the model. The study used test of goodness of fit and the explanatory power of the model R^2, F test ANOVA.

The model that was used for this study was as follows;

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \mu$$

Where;

y is the bilateral real exchange rate between the following currencies;

KES/UGX, KES/TZS, UGX/TZS.

α is the intercept.

β is beta.

x_1 is the real interest rate differential i.e. the difference between the domestic and foreign real interest rates.

x_2 is the relative inflation rate.

x_3 is the relative deficit/surplus rate.

μ is the error term.

Multiple regression analysis was also used to assess the correlation between the variables of study. Since multiple linear regression analysis allows us to estimate the association between a given independent variable and the outcome holding all other variables constant, it provides a way of adjusting for (or accounting for) potentially confounding variables that have been

included in the model. The study used Test of goodness of fit and the explanatory power of the model R2, F test ANOVA.

The study did test of Multicollinearity. Multicollinearity is a linear relationship between two explanatory variables. Two variables are perfectly collinear if there is an exact linear relationship between the two. Multicollinearity refers to a situation in which two or more explanatory variables in a multiple regression model are highly linearly related. In this study the researcher will have perfect multicollinearity if, for example as in the equation above, the correlation between two independent variables is equal to 1 or -1.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the data analysis, findings, interpretations and presentation of the study in line with the research objective. Research objective is to establish the effect of interest rate differential on the foreign exchange rate in East African forex market.

4.2 Findings

In this section data was collected for six years (2009-2014) from Kenya National Bureau of Statistics (KNBS), the Central Bank of Kenya (CBK), Bank of Tanzania (BOT), Bank of Uganda and the IMF eLibrary to establish effect of interest rate differential on the foreign exchange rate in East African forex market. The data used was KES/USD monthly average Real Exchange Rates (Forex), Real Interest Rate Differential monthly average (in %), monthly average Inflation Rates (in %) and current account deficit/surplus to determine the effects of interest rate differential on exchange rates in the East African forex market.

4.3 Descriptive Statistics

4.3.1 Kenya and Uganda

Table 4.1 below provides some descriptive statistics for Kenya and Uganda of dependent variables represented by the real exchange rate between Kenya shilling and Uganda shilling and independent variables of interest rate differential, Inflation rate and deficit / surplus the variables

in the study. These include the mean, median, standards deviation, minimum and maximum values.

Table 4.1 Descriptive Statistics – Kenya and Uganda

	KES / UGX	Interest Rate Differential	Inflation Rate	Deficit / Surplus
Mean	38.081653	.476519	8.378382	-286.888682
Median	41.273000	.244950	7.005000	-258.966200
Std. Deviation	8.9074712	3.7511086	4.7311305	141.8209192
Minimum	9.8810	-7.2158	3.1800	-612.2754
Maximum	46.2680	12.6882	19.7200	-27.4914
N	68	68	68	68

Source: Research Data

The Kenya shilling appreciated against the Uganda shilling over the six year period with a low of Ushs.9.8810 to the Kenya shilling in 2009 and a high of UGX.46.2680 in year 2012. The period recorded a mean exchange rate of KES 1 = UGX. 38.0817 while standard deviation was at 8.9074. Therefore the Kenya shilling has been on a consistent rise against the Uganda shilling which has been on a downward trend with a major jump in exchange rate in year 2009 to 2013 from KES 1 = UGX 9.8810 on to KES 1 = UGX 46.2680. The median recorded was KES 1 = UGX 41.2730**.**

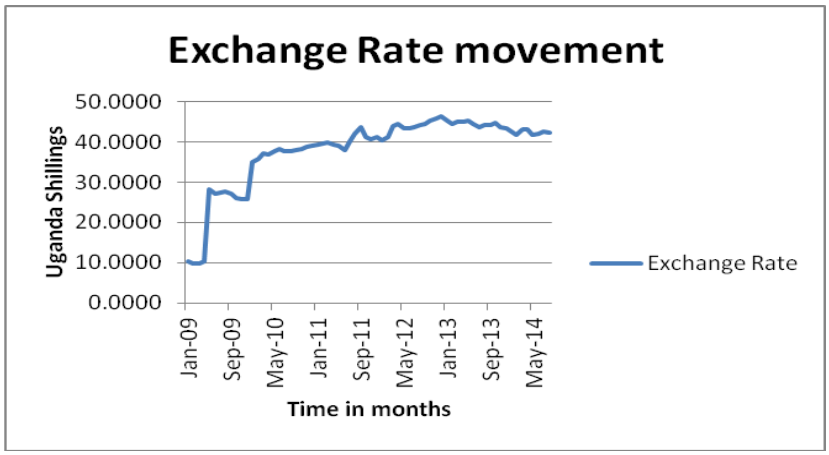

Figure 4.1: Monthly Exchange Rate – KES / UGX
Source: Research Data

Figure 4.1 above shows the movement of KES/UGX exchange rate over the period of study. The exchange rate rose from KES.1 = UGX.10 in 2009 to KES.1 = UGX.45 in 2013. This means the Kenya shilling was appreciating against the Uganda shilling during the period of study.

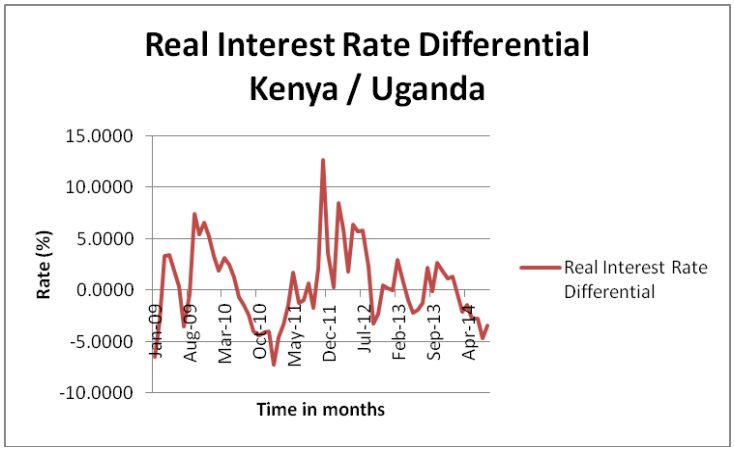

Figure 4.2: Monthly Real Interest Rate Differential - Kenya and Uganda
Source: Research Data

Descriptive statistics for Real Interest Rate differential in Fig.4.2 above record an erratic movement for the period 2009-2014 with a minimum of -7.2158 in year 2011 and a maximum of 12.6882 in the same year after which the differential rate dipped below zero mark in 2012 and

continued oscillating on this mark. The median was at 0.244950 while standard deviation recorded was 3.7511 for the period of study.

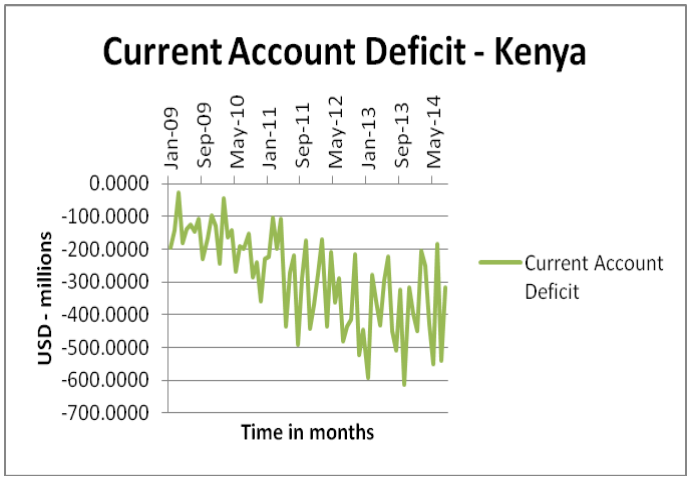

Figure 4.3: Monthly Current Account Deficit - Kenya
Source: Research Data

Current account deficit in Kenya recorded a mean of USD -286.8887 million with a low of USD. -612.2754 million in 2013 and a high of USD. -27.4914 million in 2009. The deficit generally deteriorated over the year of study with the performance registered between year 2012 and 2014.

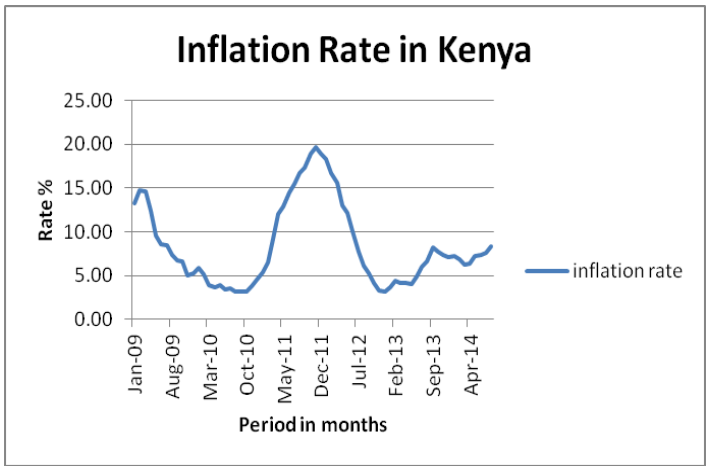

Figure 4.4: Monthly inflation rate in Kenya
Source: Research Data

Figure 4.4 above shows the movement of inflation rate on a monthly basis during the period of study 2009 – 2014.

4.3.2 Kenya and Tanzania

Table 4.2:Descriptive Statistics – Kenya and Tanzania

	KES / TZS	Interest Rate Differential	Inflation Rate	Deficit / Surplus
Mean	17.834075	2.717513	8.378382	-286.888682
Median	18.509950	2.248600	7.005000	-258.966200
Std. Deviation	2.6240037	4.8139096	4.7311305	141.8209192
Minimum	7.9994	-6.9083	3.1800	-612.2754
Maximum	22.5750	13.8570	19.7200	-27.4914
N	68	68	68	68

Source: Research Data

The Kenya shilling appreciated against the Tanzania shilling in 2009 with a sharp appreciation between May and September of the same year. Thereafter the exchange rate remained fairly stable over the period of study with a low of KES. 1= TZS.7.9994 in 2009 and a high of KES. 1 = TZS.22.5750 in the same. The period recorded a mean exchange rate of KES 1 = TZS. 17.834075 while standard deviation was at 2.6240037. Descriptive statistics for Real Interest Rate differential in Table 4.2 above record an erratic movement for the period 2009-2014 similar to that exhibited in Kenya and Uganda with a minimum of -6.9083 in year 2014 and a maximum of 13.8570 in year 2012. The median was at 2.248600 while standard deviation recorded was 4.8139096 for the period of study.

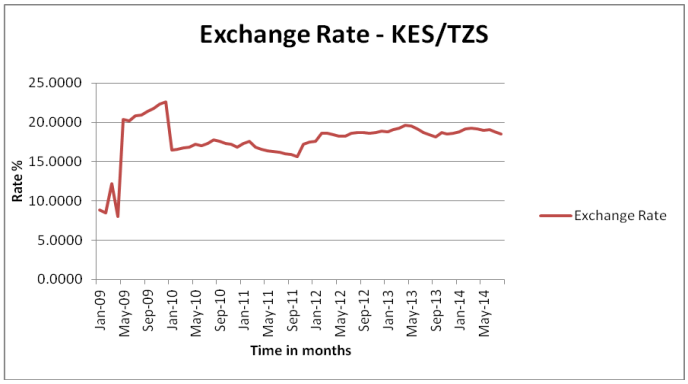

Figure 4.5: Monthly Exchange Rate – KES / TZS
Source: Research Data

Figure 4.5 above shows the movement of KES/TZS real exchange rate on a monthly basis during the period of study 2009 – 2014.

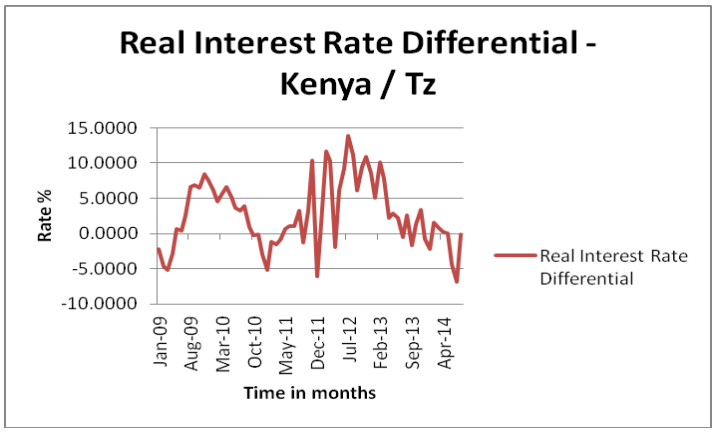

Figure 4.6: Real Interest Rate Differential – Kenya and Tanzania
Source: Research Data

Figure 4.6 above shows the movement of real interest rate differential on a monthly basis during the period of study 2009 – 2014.

4.3.3 Tanzania and Uganda

Table 4.3: Descriptive Statistics – Tanzania and Uganda

	KES / TZS	Interest Rate Differential	Inflation Rate	Deficit / Surplus
Mean	2.156279	-2.240997	10.594559	-3402.941176
Median	2.334250	-2.432600	10.060000	-3792.000000
Std. Deviation	.4369952	3.9862025	4.2986653	1.1962619E3
Minimum	1.1409	-11.7361	4.2000	-4753.1000
Maximum	2.7570	9.7579	19.7600	-1797.0000
N	68	68	68	68

The Tanzania shilling appreciated against the Uganda shilling in 2010 and again in 2011 before dropping and maintaining stability between the UGX.2.00 and UGX.2.5 against the Tanzanian shilling. The period experienced a low of TZS. 1= UGX. 1.1409 in 2009 and a high of TZS. 1 = UGX. 2.7570 in the same year. The period recorded a mean exchange rate of TZS 1 = TZS. 2.156279 while standard deviation was at 0.4369952.

Current account deficit in Tanzania recorded a mean of USD.-3402.9412 million with a low of USD.-4753.1000 million in 2014 and a high of USD.-1797.0000 million in 2009. The deficit generally deteriorated over the year of study with the worst performance registered between year 2013 and 2014.

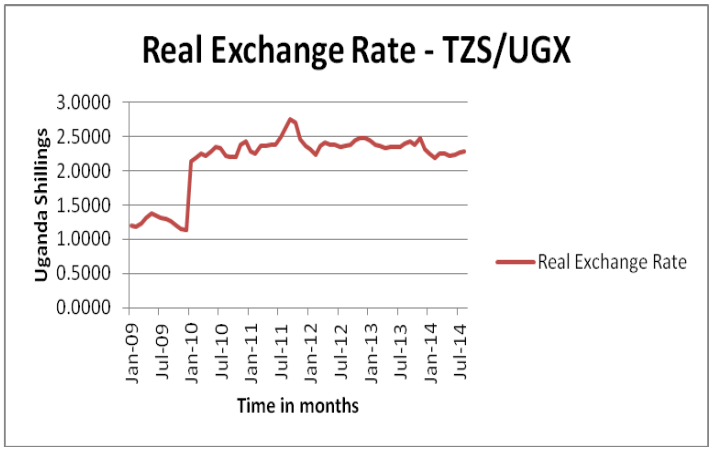

Figure 4.7: Real Exchange Rate – Tanzania and Uganda
Source: Research Data

Figure 4.7 above shows the movement of TZS/UGX real exchange rate on a monthly basis during the period of study 2009 – 2014.

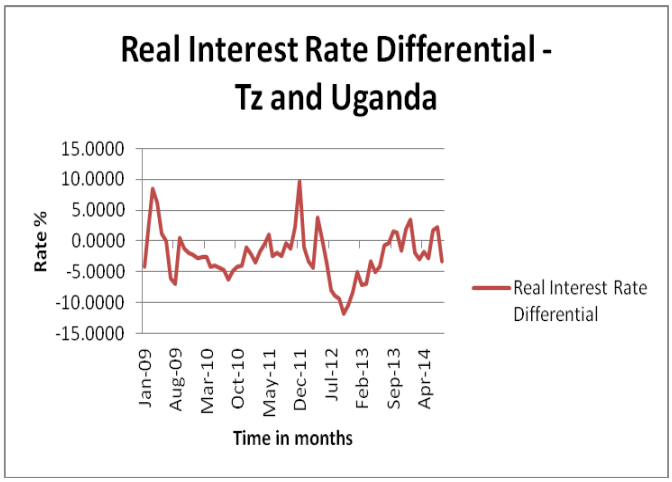

Figure 4.8 : Real Interest Rate Differential – Tanzania and Uganda
Source: Research Data

Figure 4.7 above shows the movement of real interest rate differential on a monthly basis during the period of study 2009 – 2014.

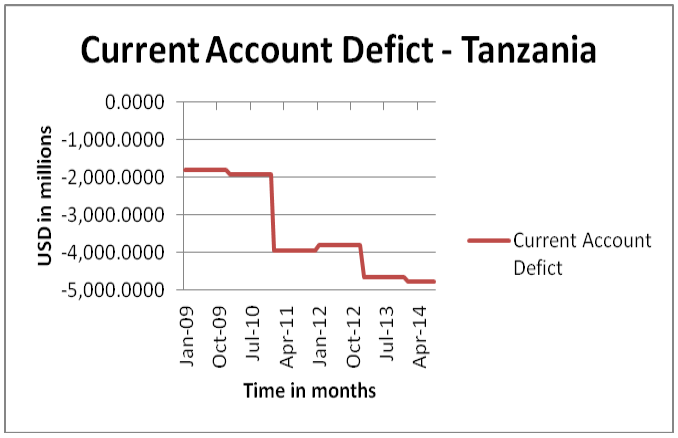

Figure 4.9: Real Interest Rate Differential – Tanzania and Uganda
Source: Research Data

Figure 4.9 above shows the movement of current account deficir on a monthly basis during the period of study 2009 – 2014.

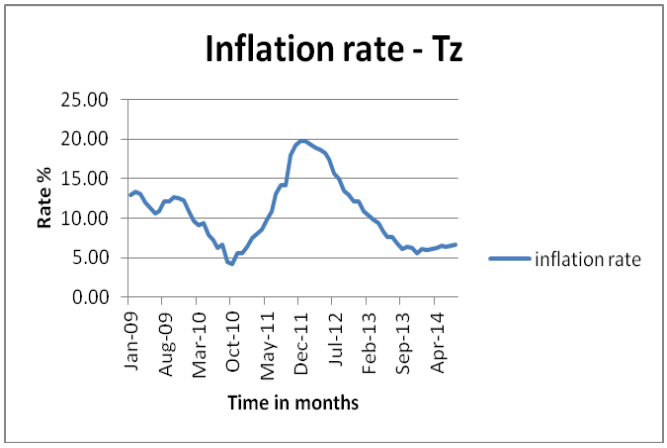

Figure 4.10 : Real Interest Rate Differential – Tanzania and Uganda
Source: Research Data

Figure 4.10 above shows the movement of inflation on a monthly basis during the period of study 2009 – 2014.

4.4 Correlation Analysis

The correlations table displays Pearson correlation coefficients, significance values, and the number of cases with non-missing values. The Pearson correlation coefficient is a measure of strength of association between two variables. Pearson correlation coefficients assume the data are normally distributed. The values of the correlation coefficient range from -1 to 1. The sign of the correlation coefficient indicates the direction of the relationship (positive or negative).

When a Pearson Correlation analysis was run on the data to test the level of association between the RER versus the values of the three independent variables, the results were as illustrated in table 4.4 below;

Table 4.4: Pearson Correlations

Correlations

		RER	Real Interest Rate Differential	Inflation Rate	Deficit / Surplus
RER	Pearson Correlation	1	.213**	-.231**	.688**
	Sig. (2-tailed)		.002	.001	.000
	N	204	204	204	204
Real Interest Rate Differential	Pearson Correlation	.213**	1	-.047	.345**
	Sig. (2-tailed)	.002		.501	.000
	N	204	204	204	204
Inflation Rate	Pearson Correlation	-.231**	-.047	1	-.188**
	Sig. (2-tailed)	.001	.501		.007
	N	204	204	204	204
Deficit / Surplus	Pearson Correlation	.688**	.345**	-.188**	1
	Sig. (2-tailed)	.000	.000	.007	
	N	204	204	204	204

**. Correlation is significant at the 0.01 level (2-tailed).

It is clear from the above table that real interest rate differential and Deficit/Surplus have a positive relationship with the RER while inflation rate recorded a negative relationship with the

dependent variable (RER). The absolute value of the correlation coefficient indicates the strength, with larger absolute values indicating stronger relationships. The correlation coefficients on the main diagonal are always 1.0, because each variable has a perfect positive linear relationship with itself. The significance of each correlation coefficient is also displayed in the correlation table, with deficit/surplus having the highest at 0.688 and real interest rate differential having the lowest at 0.213 an indication of a weak linear relationship.

The significance level (or p-value) is the probability of obtaining results as extreme as the one observed. If the significance level is very small (0.05) then the correlation is significant and the two variables are linearly related. If the significance level is relatively large (for example, 0.2) then the correlation is not significant and the two variables are not linearly related. All the three predictor variables; real interest rate differential, inflation rate and current account deficit/surplus showed some level of correlation with the dependent variable RER at 0.01 significant levels.

4.5 Regression Analysis

Multiple linear regression model was used to establish relationship between real interest rate differential, inflation rate and current account deficit/surplus and the real exchange rate (RER) in the East African forex market in the years between 2009 and 2014.

Table 4.5: Model Summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.697[a]	.485	.477	11.3344033	.082

a. Predictors: (Constant), Current Account Deficit/Surplus, INFL, Real IRD

Table 4.5 shows the R, R square, Adjusted R Square, Standard Error of the Estimate and Durbin-Watson values. The R value represents the degree and strength of relationship between RER and the independent variables. The value is 69.7% meaning the relationship between the variable is very strong. The R square is 0.485 which implies that 48.5% of the variance in the independent variables of real interest rate differential, inflation rate and current account deficit/surplus can explained in the dependent variable real exchange rate (RER). Durbin Watson value is 0.082 and it used to detect the presence of autocorrelation. Since the value is less than 3.0 then there is absence of autocorrelation.

The ANOVA table generated from the same data is as shown below;

Table 4.6: ANOVA Table

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24214.537	3	8071.512	62.829	.000[a]
	Residual	25693.740	200	128.469		
	Total	49908.277	203			

a. Predictors: (Constant), Current Account Deficit/Surplus, INFL, Real IRD

b. Dependent Variable: RER

From the ANOVA table 4.6 above; at the 5% (0.05) significance level, the model is useful for predicting the response since;

F value = 62.829 and p-value of 0.000 obviously lies below all α values ($0.000 < 0.05$), which indicates we reject the null hypothesis; $\beta_1 = \beta_2 = \beta_3 = 0$

Therefore; at the $\alpha = 0.05$ level of significance, there exist enough evidence to conclude that at least one of the three predictors is useful for predicting forex rates; therefore the model is very useful.

The coefficients table returned by running the data through analysis software is as illustrated below;

Table 4.7: Coefficients Table

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	31.234	1.797		17.385	.000		
	Real IRD	-.085	.182	-.025	-.467	.641	.881	1.136
	Inflation Rate	-.352	.173	-.105	-2.036	.043	.964	1.037
	C.A. Deficit/Surplus	.007	.001	.677	12.318	.000	.851	1.175

From table 4.8 ; using the regression model equation contemplated before i.e.

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \mu$$

Where;

y is the bilateral real exchange rate

β_1 β_2, β_3, are constants to be estimated by the model.

x_1 is real interest rate differential (in %, monthly).

x_2 is inflation rate (in %, monthly).

x_3 is current account deficit (in USD millions, monthly).

α is the intercept.

μ is the error term.

Substituting figures from table 4.7 into the RER model;

RER = 31.234 – 0.085IRD – 0.352INF + 0.007CA + μ

Interpretation:

Intercept: In any given month, the RER will be 31.234 when all the predictor values are equal to zero.

Effect of Real Interest Rate Differential on RER: The forex rates increases by a unit if the real interest differential rate decreases by 0.085 or 8.5% all other factors held constant.

Effect of inflation rates on RER: The forex rates increases by a unit on the inflation rates decreases by 0.352 or 35.2% all other factors held constant.

Effect of Current Account Deficit on RER: The forex rates increases by a unit on the current account decreasing by 0.007 or 0.7% all other factors held constant.

The model, however, is not useful in predicting variations in RER since the p-value of real interest rate differential is >0.05 from the coefficient table above.

4.6 Collinearity Diagnostics

Multicollinearity is assessed by examining tolerance and the Variance Inflation Factor (VIF). These are two collinearity diagnostic factors that can help identify multicollinearity. Tolerance is a measure of collinearity reported by most statistical programs such as SPSS; the variable's tolerance is 1-R2. A small tolerance value indicates that the variable under consideration is almost a perfect linear combination of the independent variables already in the equation and that it should not be added to the regression equation. All variables involved in the linear relationship will have a small tolerance. Some suggest that a tolerance value less than 0.1 should be investigated further. If a low tolerance value is accompanied by large standard errors and non-significance, multicollinearity may be an issue.

When multi-collinearity diagnostics were run on the three variables of interest; the results were as shown in the tables below;

Table 4.8: Collinearity statistics between forex rates and the three independent variables

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Real IRD	.881	1.136
	Inflation Rate	.964	1.037
	C.A. Deficit/Surplus	.851	1.175

With tolerance values greater than 1 which is a full proof that there is collinearity between the dependent variable and the independent variables. There is adequate evidence to rule out collinearity of RER and the three independent variables; real interest rate differential, inflation rates and current account deficit/surplus.

4.6 Discussion of Research Findings

The study found from the analysis that the average monthly KES/UGX real exchange rates (Forex) increased over the period to KES.1 = UGX.45.00. This means that the Kenya Shillings gained against the Uganda shilling from KES.1 = UGX.10.00 KES.1 = UGX.45.00. The monthly current account deficit for Kenya decreased in years from –USD.80 million in 2009 to –USD.600 million in 2013. The average monthly real interest rate differential between Kenya and Uganda was erratic during the period of study which was as a result of unstable interest rates in the two countries. The average monthly KES/TZS real exchange rate recorded a sharp increase in 2009 before declining in the same year and thereafter stabilizing at KES.1 = TZS.18.00 in the later years. The average monthly real interest rate differential between Kenya and Tanzania was also erratic. The average monthly real exchange rate between TZS/UGX rose sharply in 2010 from TZS.1 = UGX.1.2 to TZS.1 = UGX.2.70 in 2011. This means that the Tanzanian shilling

appreciated against the Uganda shilling over the period of study. The average monthly real interest rate differential between Tanzania and Uganda and inflation rate for Tanzania were both erratic in the period of study. The annual current account deficit for Tanzania declined over the period i.e. it worsened from –USD.2,000 Million in 2009 to close to –USD.5,000 million in 2014.

The study also found that in any given month, the RER will be 31.234 when all the predictor values are equal to zero. A unit increase in real interest rate differential will result in a decrease in RER by 0.085 or 8.5%. A unit increase in inflation rate will cause reduction in RER by 0.352 or 35.2% while a unit increase in current account deficit/surplus will result to an increase in RER by 0.007 or 0.7%. The model however as indicated in the ANOVA interpretation, was not useful in predicting variations in RER.

The analysis further found that there was a strong positive correlation between real exchange rate and the current account deficit/surplus at 68.8% with the least being recorded at 21.3% positive correlation between real interest rate differential and the dependent variable. These two independent variables reported a positive relationship with the dependent variable contrary to negative correlation observed from the coefficients table. The Pearson correlation for inflation rate returned a negative value at 23.1% correlation with the RER. All the independent variables had a significant correlation with the dependent variable (RER) since their p-values were <0.05.

The study found that real interest rate differential, inflation rates and current account deficit/surplus affect the real exchange rates at 47.7% while other factors contributed the

remaining percentage. This implied that, a very high percentage of changes in the real exchange rates were affected by the current account deficits/surplus in the East African forex market. The analysis sought to further check whether the three variables, specifically real interest rate differential, inflation rate and current account deficit/surplus can be used for determination of the effects of the real exchange rates. This was done through regression analysis. The regression equation indicated that the variables were substantially useful for making predictions since the value of R square at 0.485 is between 0 and 1.

Patra (2004) studied the log-run relationship between real exchange rate and real interest rate differentials using the cointegration approach between India and US for the period 1993 – 2003. It employed both Engle-Granger and Johansen tests for presence of cointegration. The model studied in this paper, as one would expect, suggested that there is good reason to believe that there would be a systematic relationship between the two variables. However, similar to some other researchers, he could not find a good empirical representation that is supported by the data and hence empirical support in favour of the above relationship. The result was robust for different measures of real interest rate differentials.

Bautista (2005) examined the relationship between exchange rate and interest rate differential in six East Asia countries by tracking the correlation of the real exchange rate and the real interest differential from 1986 to 2004 and noting the shifts in the nominal exchange rate regime. The analysis makes use of the dynamic conditional correlation multivariate GARCH model (DCC model henceforth) developed by Engle (2002). For each country, a DCC model is estimated to determine the correlation of the two variables over time. These countries are Indonesia, Korea,

Malaysia, Philippines, Singapore and Thailand. Positive time-varying correlations characterized the relation during pegged regimes. Correlations are negative during freely falling regimes.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The objective of this paper was to investigate the effect of interest rate differential on the foreign exchange rate in East African forex market. The data used was average monthly KES/UGX, KES/TZS and TZS/UGX exchange rates, average monthly real interest rate differential between Kenya and Uganda; Kenya and Tanzania; Tanzania and Uganda and average monthly inflation rates for Kenya and Tanzania for the period of study from January 2009 to August 2014. This chapter is a synthesis of the entire report and contains summary of findings, conclusions arrived at, the recommendations and the suggestions for further study.

5.2 Summary of Findings

The objective of the study was to study the effect of interest rate differential on the foreign exchange rate in East African forex market. Real exchange rate (RER) were established as the dependent variables while the independent variables were real interest rate differential, inflation rate and current account deficit/surplus. The study sought to understand the relationship between the independent variables and dependent variable. The co-efficient of multiple determinations R-square value was 0.485; this meant that about 48.5% of the variation of the response variable which is RER can be explained by the three predictor variables. This implies that the chosen variables specifically real interest rate differential, inflation rate and current account deficits in the East African market (Kenya, Uganda and Tanzania) during year 2009-2014 affect the real exchange rate by 48.5% and therefore 51.5% variations in real exchange rate (RER) was associated with other unexplained factors. The regression results also indicate that the

relationship between real interest rates, inflation rate and current account deficit/surplus and real exchanges rates is very significant at 0.05 level of significance level with a p-value of 0.000 which is <0.05. These findings conform to a study by Park (2011) which indicated that real interest rate differential and real exchange rates are all highly and negatively correlated. The study further found that a great effect was caused by the increased rate of inflation or decreased rate of inflation on the real exchange rate which had a coefficient of 0.352 or 35.2%.

The Tolerance value of more than 1 and a VIF value indicate a correlation between the independent values – real interest rate differential, inflation rate and current account deficit on real exchange rate as a dependent variable. The analysis also found that, at 0.688, the current account deficit/surplus interest rates had a strong positive association with the RER while at 0.213; the real interest rate differential had a small positive correlation with the same dependent variable. This means that there was a likelihood of increases in RER due to an increase real interest rate differential and also an increase in RER as a result of deterioration of the current account deficit. This correlates with a study by Park (2011) who sought to understand the relationship between real interest rate differential and real exchange rate after the East Asia financial crisis. The estimate of the coefficient on the real interest rates differential was significant but positive unlike the prediction of conventional interest rate parity theory. However, the sign was negative and significant on the lagged real interest differential. Korean foreign exchange reserve was estimated to have a negative significant effect on the Won/USD real exchange rate.

5.3 Conclusion

The analysis investigated the effects of interest rate differential on the foreign exchange rate in the East African forex market with specific reference to KES/UGX, KES/TZS and TZS/UGX monthly average real exchange rates, monthly average real interest rate differential, monthly inflation rates and monthly average current account deficit, all information from 2009 -2014. The study finally concluded there was no clear relationship between real interest rate differential and the real exchange rate in the East African forex market since the three models were rejected and their correlations coefficient could not establish a meaningful percentage to conclude otherwise. In the study more than 51% of the variations in the dependent variables was attributed to other unknown factors. The main predictor variable of our study in the three countries of study, the real interest rate differential accounted for less than 10% of the variation in the dependent variable, real exchange rate. As a result we could not be able to establish whether the two theories purchasing power parity (PPP) and interest rate parity (IRP) hold for this study. The results of the study are also in line with the study conducted by Lungu and Sheefani (2013) in Namibia which was also unable to detect a clear systematic relationship between the two variables.

5.4 Recommendations

The study recommends that regulators should come up with means to evaluate exchange rate movements. This will help to curb the impact that exchange rate volatility can have on an economy among other aspects such as inflation. 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.

The real exchange rate is a key factor in determining the competitiveness of a country in a world of closely interlinked economies. International capital flows have accelerated their speed and volume substantially and global financial market is now highly integrated. Nevertheless, the free capital flow and substitutability of financial products across countries do not completely guarantee the satisfaction of interest parity condition. Exchange rate determination mechanism is a complicated process and it requires rigorous theoretical applications as well as experienced expertise combining various factors of the real economy. Even so, it is worth trying to analyze available data with acceptable economic theories to improve the understanding of important relationships such as between the real exchange rate and real interest rates differential.

The final recommendation is the limitation of controlling inflation through monetary policies. A first restriction is the weak transmission mechanism of monetary policy in some developing countries— meaning that the effectiveness of the policy might be only partial. Another limitation is the output cost implied in the policy, which, depending on the country‘s economic situation and prospects, might not always be optimal.

5.5 Limitations of the 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 interest rate differential, inflation rate and current account deficit as these are observed as the key factor

affecting exchange rate. The limitations of time constraints and gathering of secondary information were also encountered in the study. This was because the data was not readily available to the public and therefore the researcher had to consult with the necessary authority for permission to access such information. Developing the statistical presentation was an uphill task, since the researcher was not very conversant with the SPSS V.18 program. This required some extra training on the software to enable proper usage of the same to get the necessary statistical presentations for the data. The researcher was also not able to acquire monthly figures for the current account deficit for Tanzania which may have influenced the outcome of the study.

5.6 Suggestions for Further Research

The study as indicated was not exhaustive of the factors affecting exchange rates in the market and its interrelationship with the factors such as inflation, current account deficit and interest rate differential. There are many factors that affect the exchange rate and therefore it is envisaged that future scholars and researchers will investigate into details the effects of factors such as relative interest rates, relative employment rate, relative corruption index, relative gross domestic product, relative tax rate, political situation, market judgment and speculation among others. The study further suggested that more research be carried out to bring forth more knowledge to the pool of literature on relationship between real interest rate differential and real exchange rate. This is because, very little literature was available to indicate the relationship between the four variables hence this study. There is also a need to identify why the data shows that since 2009 to 2014 the interest rates have been increasing, same case to the exchange rates. There must be some factors contributing to this trend and were not covered in this study, therefore, future researchers should try to bring to book such findings.

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APPENDICES

APPENDIX 1: Monthly Data Kenya and Uganda

	Kenya / Uganda			
monthly	y-RER (KES/UGX)	X1 (Real Interest Rate Differential	X2 (Inflation Rate)	X3 (Current Account Deficit / Surplus)
Jan-09	10.4212	-6.4548	13.22	-196.4539
Feb-09	9.9234	-2.9396	14.69	-141.6791
Mar-09	9.8810	3.2989	14.60	-27.4914
Apr-09	10.4733	3.4214	12.42	-182.1644
May-09	28.1703	1.8555	9.61	-139.4012
Jun-09	27.1200	0.3965	8.60	-124.3525
Jul-09	27.3985	-3.4877	8.44	-144.5196
Aug-09	27.5678	-0.3652	7.36	-109.1171
Sep-09	27.0213	7.4213	6.74	-228.6103
Oct-09	25.9996	5.3833	6.62	-167.8741
Nov-09	25.8319	6.5452	5.00	-99.0786
Dec-09	25.7324	5.2647	5.32	-128.1377
Jan-10	35.0501	3.3451	5.95	-244.9821
Feb-10	35.7374	1.8730	5.18	-46.5411
Mar-10	37.2215	3.0993	3.97	-162.4809
Apr-10	36.9260	2.4458	3.66	-144.0807
May-10	37.5964	1.1941	3.88	-268.8151
Jun-10	38.1350	-0.6626	3.49	-192.7122
Jul-10	37.6321	-1.4018	3.57	-198.0450
Aug-10	37.6891	-2.3498	3.22	-151.9080
Sep-10	38.0957	-4.0041	3.21	-284.1298
Oct-10	38.1487	-4.3654	3.18	-241.3218
Nov-10	38.8727	-4.1369	3.84	-360.1800
Dec-10	39.0520	-4.0282	4.51	-231.1196
Jan-11	39.3913	-7.2158	5.42	-224.4789
Feb-11	39.5211	-4.6101	6.54	-104.9095
Mar-11	39.7641	-3.3474	9.19	-198.9762
Apr-11	39.3550	-1.4056	12.05	-106.6004
May-11	39.0263	1.7266	12.95	-434.0282
Jun-11	38.1107	-1.2509	14.48	-273.0522
Jul-11	40.2739	-0.9447	15.53	-220.1800
Aug-11	42.0001	0.6753	16.67	-492.5560

Sep-11	43.7543	-1.6773	17.32	-289.8876
Oct-11	41.3338	2.0912	18.91	-174.4258
Nov-11	40.6590	12.6882	19.72	-441.3596
Dec-11	41.2122	3.6495	18.93	-369.3042
Jan-12	40.5041	0.2761	18.31	-273.5457
Feb-12	41.3689	8.4788	16.69	-171.1296
Mar-12	43.8849	5.9207	15.61	-436.2053
Apr-12	44.5870	1.7978	13.06	-207.6736
May-12	43.3786	6.4029	12.22	-361.2675
Jun-12	43.3643	5.7051	10.05	-289.2696
Jul-12	43.5513	5.8159	7.74	-481.3714
Aug-12	44.2327	2.3036	6.09	-436.0072
Sep-12	44.5820	-3.2783	5.32	-415.8559
Oct-12	45.3530	-2.2838	4.14	-214.4203
Nov-12	45.7741	0.4487	3.25	-521.1740
Dec-12	46.2680	0.2138	3.20	-444.8514
Jan-13	45.3767	-0.0447	3.67	-593.0948
Feb-13	44.5357	2.9595	4.45	-277.2203
Mar-13	44.9827	0.7823	4.11	-358.6222
Apr-13	45.0469	-0.9730	4.14	-432.4230
May-13	45.1826	-2.1662	4.05	-295.8189
Jun-13	44.3600	-1.8645	4.91	-221.7474
Jul-13	43.7277	-1.2070	6.03	-450.6853
Aug-13	44.2688	2.1954	6.67	-508.1001
Sep-13	44.1478	-0.0662	8.29	-324.6277
Oct-13	44.6413	2.6499	7.76	-612.2754
Nov-13	43.5994	1.7633	7.36	-315.9789
Dec-13	43.2793	1.1091	7.15	-395.3619
Jan-14	42.5079	1.3580	7.21	-450.6768
Feb-14	41.9128	-0.4319	6.86	-203.7817
Mar-14	43.1906	-2.1214	6.27	-249.1173
Apr-14	43.0404	-1.3968	6.41	-428.8264
May-14	41.8426	-2.7630	7.30	-551.9686
Jun-14	42.0921	-2.8088	7.39	-183.0976
Jul-14	42.6085	-4.6619	7.67	-541.3009
Aug-14	42.2605	-3.4371	8.36	-315.9789

Source: Central Bank of Kenya, Bank of Uganda, Kenya National Bureau of Statistics

APPENDIX 2: Monthly Data Kenya and Tanzania

Kenya / Tanzania

monthly	y-RER (KES/TZS)	X1 (Real Interest Rate Differential	X2 (Inflation Rate)	X3 (Current Account Deficit / Surplus)
Jan-09	8.8913	-2.2565	13.22	-196.4539
Feb-09	8.4403	-4.7119	14.69	-141.6791
Mar-09	12.1963	-5.1822	14.60	-27.4914
Apr-09	7.9994	-2.8707	12.42	-182.1644
May-09	20.4069	0.6997	9.61	-139.4012
Jun-09	20.2206	0.4333	8.60	-124.3525
Jul-09	20.8354	2.5516	8.44	-144.5196
Aug-09	20.9468	6.6221	7.36	-109.1171
Sep-09	21.3717	6.8210	6.74	-228.6103
Oct-09	21.7312	6.5277	6.62	-167.8741
Nov-09	22.2871	8.4548	5.00	-99.0786
Dec-09	22.5750	7.5885	5.32	-128.1377
Jan-10	16.5101	6.1623	5.95	-244.9821
Feb-10	16.5422	4.5591	5.18	-46.5411
Mar-10	16.7823	5.7536	3.97	-162.4809
Apr-10	16.8915	6.6846	3.66	-144.0807
May-10	17.2290	5.1519	3.88	-268.8151
Jun-10	17.0155	3.6978	3.49	-192.7122
Jul-10	17.2868	3.1946	3.57	-198.0450
Aug-10	17.7647	3.8603	3.22	-151.9080
Sep-10	17.5758	0.8482	3.21	-284.1298
Oct-10	17.2931	-0.2657	3.18	-241.3218
Nov-10	17.2362	-0.1680	3.84	-360.1800
Dec-10	16.8894	-2.9277	4.51	-231.1196
Jan-11	17.3225	-5.2094	5.42	-224.4789
Feb-11	17.5771	-1.1235	6.54	-104.9095
Mar-11	16.8852	-1.5286	9.19	-198.9762
Apr-11	16.5909	-0.9358	12.05	-106.6004
May-11	16.4201	0.6922	12.95	-434.0282
Jun-11	16.2960	1.1019	14.48	-273.0522
Jul-11	16.1636	0.9889	15.53	-220.1800
Aug-11	16.0077	3.1878	16.67	-492.5560

Sep-11	15.8782	-1.2787	17.32	-289.8876
Oct-11	15.6480	3.2556	18.91	-174.4258
Nov-11	17.1806	10.4246	19.72	-441.3596
Dec-11	17.4617	-6.1084	18.93	-369.3042
Jan-12	17.5734	1.3929	18.31	-273.5457
Feb-12	18.6302	11.7201	16.69	-171.1296
Mar-12	18.6335	10.2170	15.61	-436.2053
Apr-12	18.4656	-1.9865	13.06	-207.6736
May-12	18.1944	6.1097	12.22	-361.2675
Jun-12	18.2568	9.2166	10.05	-289.2696
Jul-12	18.5776	13.8570	7.74	-481.3714
Aug-12	18.6756	11.2003	6.09	-436.0072
Sep-12	18.7071	6.0449	5.32	-415.8559
Oct-12	18.6243	9.4524	4.14	-214.4203
Nov-12	18.7240	10.8436	3.25	-521.1740
Dec-12	18.8559	8.5235	3.20	-444.8514
Jan-13	18.7917	5.0299	3.67	-593.0948
Feb-13	19.0378	10.1063	4.45	-277.2203
Mar-13	19.3073	7.8017	4.11	-358.6222
Apr-13	19.6071	2.2581	4.14	-432.4230
May-13	19.5352	2.8981	4.05	-295.8189
Jun-13	19.1826	2.2391	4.91	-221.7474
Jul-13	18.7055	-0.5226	6.03	-450.6853
Aug-13	18.4529	2.6251	6.67	-508.1001
Sep-13	18.1882	-1.6460	8.29	-324.6277
Oct-13	18.6856	1.3297	7.76	-612.2754
Nov-13	18.5621	3.3344	7.36	-315.9789
Dec-13	18.6550	-0.8275	7.15	-395.3619
Jan-14	18.8314	-2.1798	7.21	-450.6768
Feb-14	19.1626	1.5028	6.86	-203.7817
Mar-14	19.2521	0.8431	6.27	-249.1173
Apr-14	19.1543	0.3102	6.41	-428.8264
May-14	18.9380	-0.0583	7.30	-551.9686
Jun-14	19.0603	-4.4636	7.39	-183.0976
Jul-14	18.7845	-6.9083	7.67	-541.3009
Aug-14	18.5543	-0.1680	8.36	-315.9789

Source: Central Bank of Kenya, Bank of Tanzania, Kenya National Bureau of Statistics

APPENDIX 3: Monthly Data Tanzania and Uganda

Tanzania /Uganda

monthly	y - RER(TZS/UGX)	X1 (Real Interest Rate Differential	X2 (Inflation Rate)	X3 (Current Account Deficit / Surplus)
Jan-09	1.2048	-4.1983	12.89	-1,797.0000
Feb-09	1.1769	1.7723	13.31	-1,797.0000
Mar-09	1.2316	8.4811	13.00	-1,797.0000
Apr-09	1.3109	6.2921	12.01	-1,797.0000
May-09	1.3812	1.1558	11.34	-1,797.0000
Jun-09	1.3400	-0.0368	10.66	-1,797.0000
Jul-09	1.3140	-6.0393	10.89	-1,797.0000
Aug-09	1.3021	-6.9873	12.09	-1,797.0000
Sep-09	1.2584	0.6003	12.08	-1,797.0000
Oct-09	1.1957	-1.1444	12.66	-1,797.0000
Nov-09	1.1558	-1.9096	12.46	-1,797.0000
Dec-09	1.1409	-2.3238	12.24	-1,797.0000
Jan-10	2.1389	-2.8172	10.87	-1,924.0000
Feb-10	2.1789	-2.6861	9.63	-1,924.0000
Mar-10	2.2451	-2.6543	9.04	-1,924.0000
Apr-10	2.2175	-4.2388	9.36	-1,924.0000
May-10	2.2750	-3.9578	7.93	-1,924.0000
Jun-10	2.3434	-4.3604	7.19	-1,924.0000
Jul-10	2.3373	-4.5965	6.27	-1,924.0000
Aug-10	2.2208	-6.2101	6.60	-1,924.0000
Sep-10	2.1992	-4.8523	4.49	-1,924.0000
Oct-10	2.2059	-4.0997	4.20	-1,924.0000
Nov-10	2.3759	-3.9690	5.50	-1,924.0000
Dec-10	2.4226	-1.1004	5.60	-1,924.0000
Jan-11	2.2786	-2.0064	6.42	-3,951.0000
Feb-11	2.2484	-3.4865	7.49	-3,951.0000
Mar-11	2.3567	-1.8188	8.03	-3,951.0000
Apr-11	2.3713	-0.4698	8.57	-3,951.0000
May-11	2.3822	1.0344	9.74	-3,951.0000
Jun-11	2.3738	-2.3527	10.91	-3,951.0000
Jul-11	2.4903	-1.9336	13.00	-3,951.0000
Aug-11	2.6202	-2.5125	14.14	-3,951.0000
Sep-11	2.7570	-0.3986	14.14	-3,951.0000

Oct-11	2.7066	-1.1644	17.92	-3,951.0000
Nov-11	2.4566	2.2635	19.17	-3,951.0000
Dec-11	2.3638	9.7579	19.76	-3,951.0000
Jan-12	2.3157	-1.1168	19.73	-3,792.0000
Feb-12	2.2298	-3.2413	19.39	-3,792.0000
Mar-12	2.3641	-4.2963	18.95	-3,792.0000
Apr-12	2.4185	3.7843	18.66	-3,792.0000
May-12	2.3824	0.2932	18.23	-3,792.0000
Jun-12	2.3733	-3.5115	17.39	-3,792.0000
Jul-12	2.3432	-8.0411	15.71	-3,792.0000
Aug-12	2.3644	-8.8967	14.91	-3,792.0000
Sep-12	2.3819	-9.3232	13.51	-3,792.0000
Oct-12	2.4376	-11.7361	12.88	-3,792.0000
Nov-12	2.4723	-10.3950	12.10	-3,792.0000
Dec-12	2.4798	-8.3097	12.05	-3,792.0000
Jan-13	2.4395	-5.0746	10.92	-4,650.6000
Feb-13	2.3780	-7.1468	10.36	-4,650.6000
Mar-13	2.3685	-7.0194	9.76	-4,650.6000
Apr-13	2.3312	-3.2311	9.38	-4,650.6000
May-13	2.3501	-5.0643	8.34	-4,650.6000
Jun-13	2.3494	-4.1036	7.64	-4,650.6000
Jul-13	2.3468	-0.6844	7.53	-4,650.6000
Aug-13	2.3972	-0.4298	6.74	-4,650.6000
Sep-13	2.4220	1.5797	6.05	-4,650.6000
Oct-13	2.3836	1.3202	6.32	-4,650.6000
Nov-13	2.4721	-1.5710	6.24	-4,650.6000
Dec-13	2.3179	1.9365	5.56	-4,650.6000
Jan-14	2.2530	3.5378	6.03	-4,753.1000
Feb-14	2.1875	-1.9347	5.98	-4,753.1000
Mar-14	2.2431	-2.9645	6.07	-4,753.1000
Apr-14	2.2431	-1.7070	6.28	-4,753.1000
May-14	2.2176	-2.7047	6.48	-4,753.1000
Jun-14	2.2380	1.6548	6.41	-4,753.1000
Jul-14	2.2714	2.2464	6.53	-4,753.1000
Aug-14	2.2757	-3.2691	6.70	-4,753.1000

Source: Bank of Tanzania and Bank of Uganda