THE EFFECT OF INTEREST RATE DIFFERENTIALS ON EXCHANGE RATE VOLATILITY OF EAST AFRICAN COMMUNITY CURRENCIES

BY

DESIRE NTIRABAMPA

REGISTRATION NO: D63/6260/2017

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE IN FINANCE DEGREE, UNIVERSITY OF NAIROBI

NOVEMBER, 2018

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

Desire Ntirabampa

D63/6260/2017

Signed: …….... Date: .....

This research Project has been submitted for examination with our approval as the university supervisor and co-supervisor.

Signed: ..... Date: .....

D. Chirchir

Lecturer, School of Business

Department of Accounting and Finance

Signed: ..... Date: .....

Dr. Cyrus Iraya

Lecturer, School of Business

Department of Accounting and Finance

ACKNOWLEDGEMENT

On the threshold of this project, it is a great pleasure for me to express my acknowledgement and my deep gratitude to all those who contributed to its realization in one way or another.

I am grateful to God for giving me strength, wisdom and courage throughout my life, without Him I would not have come this far in my studies. I would also wish to acknowledge my supervisor Dr. Dan Chirchir and co-supervisor Dr. Cyras Iraya for their invaluable and active guidance throughout the project. They did more than their call of duty to ensure that this project is completed.

I must admit humbly that the success of this research has been largely due to the support of my fellow students and my colleagues who in various ways have encouraged me throughout the project work and a have also allowed me to learn a lot from them. 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 Jacques Ruginga, my mother Félicité Mpitabakana, my sister Seraphine Nduwimana, my sponsor Venerand Kazohera 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 test the effect of interest rate differentials on the exchange rate volatility of East African Community currencies. The literature developed was steered by the Purchasing Power Parity theory, Fisher Effect theory and the International Fisher Effect theory. The study used a descriptive research design and the sources of information were Central Bank of Kenya, Bank of Uganda, Bank of Tanzania, Bank of the Republic of Burundi, National Bank of Rwanda and the IMF e-Library. Average monthly exchange rates, interest rate differentials, inflation rate differentials and relative current account balances are the data used for a period starting from January 2013 to December 2017. A panel data regression model was used to model the relationship between the dependent variable (exchange rate) and explanatory variables (interest differential, inflation differential and relative current account balance). Hausman test showed that the fixed-effects model is the suitable model to be used for our study. Therefore, the study found that 98.8% of the variation in the dependent variable is explained by the three independent variables. Interest differential was the main predictable variable with a coefficient's value of 0.0274 which means that in EAC an increase by 1 point in interest rate differential leads to the depreciation of home currency by 0.0274 points. Relative current account balance contributes also to home currency depreciation with a coefficient's value of 0.000052. However, the study could not be able to find the expected results for inflation differential as it has a negative coefficient's value (-0.0075). This contradicts the economic theory on inflation differential and may due to other variables that were not included in the regression but can have a great importance in the explanation of exchange rate movement. The unfortunate coefficient may also due to computations done in this study to find monthly data on the current account balance of Rwanda and Uganda as these countries do not publish monthly data on that variable. That was the major limitation of 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 interest rate differential and exchange rate volatility in the region of EAC.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
BIF	Burundian Franc
CAD	Canadian Dollar
DEM	German Deutsche Mark
EAC	East African Community
EVIEWS	Econometric Views
FE	Fisher Effect
GBP	British Pound
IFE	International Fisher Effect
IMF	International Monetary Fund
IPS	Im, Pesaran and Shin
JPY	Japanese Yen
KES	Kenya Shilling
KRW	South Korean Won
LL	Levin and Lin
NOK	Norway Krone
OLS	Ordinary Least Square
PP	Philippe and Perron
PPP	Purchasing Power Parity
RWF	Rwandan Franc
SEK	Sweden Krona
SWF	Swiss Franc
TZS	Tanzania Shilling
UGX	Uganda Shilling
UK	United Kingdom
USD	United States Dollar
VECM	Vector Error Correction Model
WDI	World Development Indicators

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

In international markets, a close connection exists between interest rate differentials and exchange rate volatility because when investors decide where to place their funds, they choose between assets that are denominated in different currencies whose values can fluctuate due to some economic fundamentals that affect them like inflation rates and rates of interest differentials between home and foreign countries (Lungu, 2014). Higher interest rates in any country can reduce money demand and cause rise in price level, which in turn can lead to exchange rate depreciation (Sargent & Wallace, 1981; Furman & Stiglitz, 1998).

Many theories have tried to associate interest rate differentials and exchange rates volatility by putting together inflation, interest and exchange rate as three variables that can move in time when outside interventions to monetary markets are limited (Solnik, 2000). Purchasing Power Parity (PPP) theory asserts that volatility in exchange rates over time will be determined by relative change in inflation rates, while Fisher (1930) Effect theory attests that rise in a country's expected inflation should, ceteris paribus, go with a rise in its nominal interest rate. However, these two theories are combined in one generalized theory (the international Fisher effect) which says that the expected change in exchange rates is given by difference nominal interest rate differentials across countries (Hacker, Huynjoo & Kristofer, 2010).

East African Community (EAC) currencies face exchange rate challenges in terms of commodity exports or goods and services imports, and exchange rate management has been complicated by the general move towards greater exchange rate flexibility in the region (Simone & Maxwell, 2017).

In addition to global events that affect these currencies, regional diversities in relative productivity growth of marketable versus non-marketable sectors lead to difference in inflation rates among EAC partner states, which forces national policy makers to practice different interest rates on domestic investments (Jemma & Anh, 2017). Consequently, these interest differentials among countries lead to exchange rate fluctuations of their currencies. Therefore, this study tests the effect of interest rate differentials on exchange rate volatility of EAC currencies.

1.1.1. Interest Rate Differentials

Interest rate differential is the difference between home country's interest rate and the interest rate in foreign country (Hacker et al., 2010). Interest rate differential between two economies can also be defined under the uncovered interest rate parity as the expected home currency's depreciation against the foreign currency (Nathan, 2006).

International investors like traders in foreign exchange markets use difference in interest rates to rate future exchange rates because interest rate differentials reflect the interaction between exchanges of money (Patterson, Kristina, Ben & Lygnerud, 1999). The difference in nominal interest rates of securities with same aspects except the currencies in which they are denominated can be explained by the anticipated exchange rate changes between those currencies over the holding period (Fisher, 1930). When, the average return earned from foreign assets purchase is different from the one earned from investing in home assets, investors can tend to take their capital to higher interest rate countries, where they expect higher returns from their deposits. Investors can also borrow in countries where nominal interest rate is low and go to invest where the nominal interest rate is high. This capital movement will increase the currency value of countries with higher nominal interest rates.

When it comes to using interest rates in exchange rate determination models, there seems to be no empirical consensus on whether to use short or long term interest rates. Johansen and Juselius (1992) and McNown and Wallace (1994, 1989) used short-term interest rates arguing that national banks get involved in the money market to smooth out short-run interest rate movements which affects in turn their information content. Frankel (1979) used long-term interest rates as an intermediary for anticipated inflation; Kim and Mo (1995) used both short and long term rates while Francisco and Razzak (1999) used only long-term interest rate differentials.

1.1.2. Exchange Rates Volatility

When one currency is compared to another, the value obtained is known as exchange rate (Krugman, 2011). In other words, it is any country's currency price in terms of another country's currency. Exchange rates determination is done in the foreign exchange market, where different buyers and sellers trade different currencies continuously. The exchange rate system is categorized into fixed and floating exchange rates.

The fixed exchange rate system, is the one set by the government which tries to keep exchange rates fixed even if the rate chosen differs from the current equilibrium rate, usually by declaring a band within which the rate is allowed to vary. In the floating or flexible exchange rate system, rate of exchange is set by the market conditions. Floating exchange rate settlement can also be influenced by the government in case of monetary stabilization.

Exchange rates play an important role for international investors when it comes to substituting their capital. Practically, challenges amount to whether uncovered interest parity holds, or exchange risk premium can help to differentiate expected future spot rates and forward rates.

Some empirical studies have showed that exchange rate volatility induces firms to a high exchange risk and therefore decreases the volume of international trade (Broll, 1994; Baron, 1976a; Clark, 1973; Hooper & Kohlhagen, 1978); reason why firms try to avoid this exchange risk by using hedge instruments.

The literature explains nominal exchange rates by using two major strands of models: monetary approach and portfolio balance approach (Menzie, 2011). The monetary model considers exchange rates as currencies' relative prices, which rely on the relative demands and supplies of money stocks. This strand recognizes flexible prices version (Bilson, 1981; Frenkel, 1976) and sticky prices version (Frankel, 1979; Dornbusch, 1976). The purchasing power parity is said to hold continuously in the first alternative, and with only long run evidence in the second alternative. According to the portfolio balance model, assets designated in different currencies are not perfectly substitutable; which implies that returns on bonds, when expressed in a common currency, may vary because of risk premium (Frankel, 1984). When capital moves perfectly but without perfect substitutability, investors will see home and foreign bonds as imperfect substitutes. Hence, some investors will allocate their securities in light of expected returns (indicated in a common currency).

1.1.3. Effect of Interest Rate Differentials on Exchange Rate Volatility

Theoretically, the interest rate differentials and exchange rate volatility relationship may behave differently between the sticky-price approach and flexible-price approach. The sticky-price approach supports a negative relationship between the two variables by arguing that a relative increase in home interest rates reflects an increase in the home real interest rate (Dornbusch, 1976; Frankel, 1979). Therefore, a rise in home rates of interest will attract foreign capital inflows and thus induces the home currency's appreciation.

On the other hand, the flexible-price approach opposes the above conclusion and contends that the relationship between volatility of exchange rates and differences in interest rates is positive (Mussa, 1979; Frenkel, 1976). Changes in interest differentials reflect expected inflation differential changes or the expected rate of currency depreciation. A rise in home interest rates will reflect a rise in expected inflation. This will force investors to reduce their demand for the home currency, thus leading to exchange rate depreciation.

However, the effect of interest rate differentials on exchange rate volatility is well explained by the international Fisher effect theory which assigns exchange rates volatility to differences in interest rates among countries. It is assumed that at any point in time, a country with relatively higher nominal interest rate should bear a depreciation of its currency value because higher nominal rates of interest reflect higher expected inflation (Carlos, 2005). This ensures that no investor in either country is better off with the same level of investment.

1.1.4. East African Community Currencies

East African community official currencies are Kenya shilling (KES) for Kenya, Uganda shilling (UGX) for Uganda, Tanzania shilling (TZS) for Tanzania, Burundian Franc (BIF) for Burundi, and Rwandan franc (RWF) for Rwanda. The East African foreign exchange market includes some financial flow restrictions that are specific to the foreign exchange market of each member country (Stephen, 2014). Therefore, there are differences in exchange rate flexibility across countries: Kenya, Uganda and Tanzania uphold a floating exchange rate regime and they deploy comparable operational procedures for exchange rate management. Floating exchange rate's value is established in the interbank foreign exchange market as it was agreed by the three countries authorities.

Burundi operates a stabilized regime (as of 2011) while Rwanda operates a crawl-like regime (Christopher et al., 2012). These divergences in the management of exchange rates among countries are reflected in the structural characteristics of the foreign exchange markets. In Kenya, Uganda and Tanzania, the markets are considered to be broadly competitive while the national banks are important but not decisive player in the market like the way it is in Rwanda and Burundi.

In this two countries, foreign aid flows to government represent around half of all foreign exchange inflows, and where the private financial sector is less developed. Regarding interest rates in the EAC region, they have stayed almost stable and above the inflation rates for some periods since its foundation, which shows that securing credit for investment is prohibitive in the region. There are divergences in interest rates among EAC partner states which mainly reflect differences in inflation across countries (Jemma & Anh, 2017).

Divergences in inflation rates among EAC partner states have led to divergence in interest rates movement, which in turn causes exchange rate fluctuations among EAC currencies. For instance, the average spot exchange rate between Kenya shilling and Burundian franc was 1Ksh/Bif 16.01 and 1Ksh/Bif 16.61 in 2015 and 2016 respectively, while nominal interest rate was 14.2% in Kenya and 16.67% in Burundi (WDI, 2015 & 2016). This means that the increase in exchange rate in this period was caused by the increase in nominal interest rate (from 2 to 2.47) if we consider Burundi as a home country. This idea supports the IFE theory that assigns exchange rate changes to difference in nominal interest rates among two countries.

1.2. Research Problem

The capital mobility has affected currencies and interest rates of low-income developing economies like those of EAC where exchange rate's level and its fluctuations determine the volume of exports, capital accumulation and growth (Ibrahim & Raimundo, 2005). Exchange rates are sensitive to international capital movement (financial flows) and information. This movement depends upon various macroeconomic factors such interest rate, inflation rate, public debt, terms of trade, etc., among countries and can cause different pass-through effects in those countries that mostly rely on imports (Honohan & Lane, 2003&2004). The interest rate differential across countries affects the exchange rate volatility of their currencies (Fisher, 1930) because the level of a countries' nominal interest rate reflects the expected inflation rate, which in turn will lead to fluctuation of its currency exchange rates.

Since 1990s, EAC countries experienced asymmetric inflation rates caused by various heterogeneities in the region based on relative productivity growth of tradable against non-tradable sectors (Simone & Maxwell, 2017), and this has led to differences in interest rates across partner states. The average inflation rate for the post-2000 period, is 9% in Burundi, 7.85% in Kenya, 6.45% in Rwanda, 7.43% in Tanzania, 6.87% in Uganda; with a dispersion of 0.88 (Jemma & Anh, 2017).

The main objective of EAC is to initiate and sustain high growth accompanied by some fundamentals such as low rate of inflation, increased investment and saving rates, enhanced fiscal discipline via low external debt and low fiscal deficits, increased export-oriented growth with enhanced current account balances, facilitated by real exchange rates that are depreciating, and better institutions, governance, and favorable business atmospheres that foster foreign direct investments (Stephen, 2014).

Therefore, combining interest rate differentials with exchange rate volatility is one of the factors that can contribute to the macroeconomic stability of the EAC, as it can show the trend of the relationship between both variables.

Most studies related to interest rate differentials and volatility of exchange rate have concentrated much on developed countries. Reviews by Aliber and Stickney (1975), Emil (2002), Ersan (2008), Fransisco and Razzak (1999), Siti and Eno (2009), Hacker et al. (2010) and Maurice (2012) suggested that the relationship between nominal interest rate differentials and exchange rate changes is positive in the long-run and negative in the short-run. Lungu and Johannes (2014) argued that such a relation is systematically unclear. Generally, this relation does not hold for all pairs of countries and also depends on whether countries are taken as domestic or foreign countries in the analysis.

In case of EAC, there is no enough studies that have been done to verify the relationship between interest differential and exchange rate volatility across partner states. A study done by Stephen (2014) found an unclear relationship between real interest rate differential and the real exchange rate in East African forex market. He realized that difference in real interest rates influences the real exchange rate volatility at only 10% in the three countries Kenya, Uganda and Tanzania.

In most empirical studies, the interest rate differential and exchange rates volatility relationship is not clear. This means that there may be some obstructions to foreign trade that may influence the adjustment of exchange rates apart from nominal interest rate differentials. Exchange rates can fluctuate due to other factors such as taxes, transaction costs, political risk, and strong country's monetary policy changes. These factors may prevent a free movement of capital between countries so that their nominal interest rate differentials can be compared (Emil, 2002; Salas, Andrea, & Rodrigo, 2015).

Therefore, the central question in this study is based on whether nominal interest rate differential can be used to anticipate future exchange rate volatility among EAC currencies. In other words, does a change in nominal interest rate differentials lead to exchange rates volatility of EAC currencies? If yes, in which direction?

1.3. Research Objective

This study aims at testing the effect of interest rate differentials on the exchange rate volatility of East African Community currencies.

1.4. Value of the Study

This study helps in understanding the expected relationship between some macroeconomic indicators such as inflation, interest rate and exchange rate in EAC partner states; a relationship that can help EAC investors in assessing future expected returns while making today's investment decisions. It can also help to appraise the price competitiveness of foreign imports and also in examining countries' export opportunities.

Findings, recommendations and conclusions that are made in this study will benefit all bodies that depend on the interest rates and exchange rates to make better and informed decision on the exchange rate volatility matters.

This study can help for policy formulations by East African Community partner states in their economic planning such as those related to the macroeconomic convergence arrangements leading to the East African Monetary Union. The study can help practically in anticipating currency exchange rate changes through the analysis of the difference in interest rates among EAC partner states.

The study can also help theoretically by evaluating how exchange rates are associated to interest rates in long-run periods through the Purchasing Power Parity, Fisher Effect (FE) hypothesis, and the International Fisher Effect (IFE).

In the practice of finance, this study can help other researchers who will carry out a similar study, where they will be more informed about the effect of interest rate differentials to exchange rate volatility and can come up with other additional information in understanding the links between countries 'interest rates and exchange rates of their currencies.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter is built on two main parts. The first part focuses on the theoretical approaches that relate volatility of exchange rates and differences in interest rates. This relationship is mainly explained by three connected theories such as purchasing power parity (relative version), Fisher effect, and international Fisher effect. This part also discusses some determinants of exchange rate volatility. The second part deals with an empirical literature review on this study.

2.2. Theoretical Review

This section discusses the main theories that try to connect interest rate differentials and exchange rates volatility.

2.2.1. Purchasing Power Parity

Established by Gustav Cassel (1918), the PPP theory suggests that level of prices in any two countries should be equivalent when they are expressed into a common currency.

The PPP (relative version) upholds that exchange rates between two currencies will be adjusted to reflect price level changes in their countries, which means that exchange rate changes move to offset the difference in rates of inflation within the two countries (Ersan, 2008). Therefore, countries with higher rates of interest should see their currencies depreciating regarding those countries with lower inflation rates (Shapiro, 1998). Exchange rate changes will offset the inflation differentials and when inflation rate in foreign country is relatively small.

Ceteris paribus, a rise in a country's expected inflation rate or actual inflation makes it expensive to hold its currency over time, and thus countries with higher inflation rates should see their currencies depreciated relative to lower inflation rate countries.

Therefore, there is no short run empirical evidence of this theory (Webster, 1987). It doesn't explain the short run exchange rate movement, but many empirical studies support its validity in the long-run period. For example, Galliot (1971) in his analysis concluded that price fluctuations are the main causes of long-run exchange rates movement. Also, Shapiro (1998) in his investigation among 22 countries showed that countries with higher inflation rates have the highest depreciation of their currencies.

Some other studies demonstrated that PPP can hold well for some time periods but not for others (Krugman & Obstfeld, 1997).

The relative PPP assumptions can help to determine the long run movements in exchange rates of EAC currencies even if there is no clear-cut conclusion to be drawn on whether these exchange rates can offset differences in inflation among countries in short time or long time period. Divergences in inflation rates, exchange rates volatility, and nominal interest rates among these countries make confusions on the validity of this theory until an empirical verification is done. PPP appears to be a poor explanation for the short-run exchange rate movements, as many studies support the long-run evidence (Demirag & Goddard, 1994).

2.2.2. Fisher Effect Hypothesis

Developed by Irving Fisher (1930), the theory of Fisher Effect links inflation and interest rate. On one hand, the domestic Fisher Effect states that the nominal interest rate of a country is influenced by the real interest rate and the expected rate of inflation over the interest rate term.

On the other hand, the generalized Fisher Effect version postulates that real returns are equalized worldwide by means of arbitrage (Emil, 2002). When there is permission of arbitrage, local capital markets will be incorporated throughout the world and real interest rates will be established by the global demand and supply of funds. Therefore, higher inflation rates countries should have higher rates of interest while those with lower inflation rates will consequently encounter lower interest rates (Shapiro, 1998).

However, various empirical studies on the Fisher hypothesis have reached different conclusions. For example, Fama (1975) tested whether the United States Treasury bill (T-bill) market is efficient from January 1953 to July 1971 and found that inflation rate can be predicted in an efficient market and a relationship between the nominal interest rate and inflation rate exists at some points of time. For the whole period, nominal interest rates were able to summarize all information about expected inflation rate. Therefore, T-bill market appears to be efficient in the fact that inflation can be well predicted by short term interest rates. Contrary, Mishkin (1992) on the same study used monthly inflation rates and a one to twelve US Treasury bill rates, between February, 1964 and December, 1986. Results showed no short term evidence of Fisher effect hypothesis. The efficiency of Fisher effect in a long run suggests that the correlation between interest rate and inflation is strong when both inflation and interest rate exhibit trends.

The Fisher effect hypothesis in EAC can be connected to the facility of capital movement among partner states. Some factors can inhibit capital from moving across EAC countries so that it can benefit from real interest differentials and satisfy Fisher Effect conditions. These factors can be for example taxes, transaction costs, psychological barriers, currency risk, political risk, etc. (Solnik, 2000; Shapiro, 1998).

If capital markets are perfect and capital is completely mobile, this would consequently equalize real interest rates across all countries, and difference in nominal interest rates and the expected inflation rate differential would be equivalent in equilibrium (Demirag & Goddard, 1994; Shapiro, 1998).

2.2.3. International Fisher Effect

IFE was developed by Fisher (1930) and combines the PPP (relative version) and the generalized Fisher effect version. It implies that countries' difference in nominal interest rates will equal to exchange rates of their currencies, and thus the currency with higher interest rate will depreciate as higher nominal interest rates are assumed to reflect expected inflation rate (Demirag, 1994; Madura, 2010). On average, the effective return on a domestic investment should be the same as the effective return on a foreign investment explained by foreign country's interest rate and the % change in the value of that foreign currency denominating such security (Maurice 2012). Therefore, the foreign country's currency will face appreciation / depreciation when the domestic interest rate is higher / less than the foreign interest rate.

IFE theory has faced some contradictions in its practice. Some studies argue that it holds only in the long time period. Aliber and Stickney (1975) in their analysis on 13 developed and undeveloped countries concluded that IFE is satisfied only in the long run, because variables presented large deviations to meet the validity of IFE in short run. Also, Kane and Rosenthal (1982), analyzed the Eurocurrency market in the 6 major countries between 1974 and 1979, and confirmed the validity of IFE hypothesis. Other studies support that the IFE is not empirically satisfied since it requires that returns must be equalized in two countries through arbitrage; and that their findings showed that higher returns are achievable (Robinson & Warburton, 1980).

The evaluation and application of IFE in the case of EAC can help in facilitating the illustration of expected relationship between volatility in exchange rates and difference in interest rates among countries. IFE originates from the efficient market hypothesis by considering how exchange rate market works and how quick the rate of exchange and the nominal interest rate reflect new information. In fact, this new information should represent the difference in nominal interest rates among partner states, which in turn reflect differences in expected inflation rates (Salas et al., 2015). Thus, volatility in exchange rate is expected to comply with interest rate differentials.

2.3. Determinants of Exchange Rate Volatility

Many variables can determine exchange rate directly or indirectly, and the main determinants are interest rate differentials, inflation rate, current account balance, foreign investment or capital inflow.

2.3.1. Interest Rates

The manipulation of interest rates by national banks influences exchange rates and inflation rates. A change in interest rate can help countries with higher interest rates in attracting foreign capital and this can result in exchange rate volatility of their currencies (Anita, 2013).

Therefore, an inverse relationship occurs when interest rates are decreasing, which means that lower interest rates will have tendency of decreasing the exchange rates. In a study done between Euro area and abroad, Maeso, Osbat, and Schnatz (2002) found that an increase in interest rate differentials between the two areas appreciate the Euro currency significantly. Contrary, Jamal (2005) affirmed that the relationship between Korea currency value and interest rate was not significant during Asia financial crisis.

2.3.2. Inflation Rate

The effect of inflation on exchange rate is well explained by the PPP theory, which asserts that when inflation rises in a given country relative to other countries, its exports will decrease while imports will increase and therefore reducing its currency value (Ebiringa & Anyaogu, 2014). The general rule of PPP is that higher inflation countries will see their currencies depreciating relative to currencies of their trading partners.

2.3.3. Current Account Balance

This is the balance between a country and its other trading partners worldwide. The current account balance is mainly established by the quantity of net exports (value of imports of goods and services subtracted from value of exports) because its other constituents (net factor payments and net transfers) are, mostly, relatively small. Therefore, current account balance of any country plays a crucial role in its exchange rates determination (Anita, 2013).

A country experiences deficit current account when it imports or spends more on foreign trade than what it exports or earns from abroad. Consequently, the country will need more foreign currency than it is getting from its exports. In fact, excess of foreign currency demand decreases the country's exchange rate (Taylor, 2001).

2.3.4. Capital Inflows

Capital inflows or foreign investments are said to be among factors that increase investment gap in most developing countries (Nwosa & Amassoma, 2014). Large capital inflows lead to exchange rate volatility of home countries' currencies, and thus decreasing the trade competitiveness of their economies (Ghosh, 2010; Luiz, Fernando & Aline, 2012).

According to Rashid and Husain (2010), a decrease in trade competitiveness can intensify the public debt (internal or external); worsens fiscal deficit and yet breaks down the current account balance. In addition, enormous capital inflows can cause challenges for economic managers in the preparation of macroeconomic policies. The reason is that when managers attempt to slow down the appreciation of exchange rates by monetary policy tightening, it can even lead to further inflows of foreign capital into the local economy (considering that higher rates of interest differentials reflect higher returns) and thus putting further pressure on the exchange rate volatility (Caruana, 2011).

2.4. Empirical Review

For a period of study starting from 1993 to 2009, Hacker et al. (2010) investigated the relationship between the spot exchange rate and the interest rate differential for seven pairs of countries, with a small country, Sweden, included in each of the cases. The methodology used was Wavelet Approach which consists of grouping time-series into various scales and helps to analyze them on a scale-by-scale basis.

Regressing with this approach facilitates the researcher to work on non-stationary economic time-series and consider time-varying relationships. They used three-month interest rates, with monthly and quarterly spot exchange rates against the Swedish krona (SEK) of five major currencies (USD, JPY, Euro, GBP and SWF) and two other currencies (NOK, and KRW). Findings demonstrated that the relationship between the two variables is negative in the short-run periods, at wavelet scales of a half year or less, and positive in the long-run periods more than one year.

Ersan (2008) analyzed the effect of change in interest rates on the exchange rate between Turkey and the G-5 countries of United States, United Kingdom, Japan, France and Germany on 3 sub-periods of time.

The first period includes US, UK and Japan, between January 1985 and December 2007. The second one considers a group of the US, Germany, France, japan and the UK, between January 1985 and December 1998; while the third period includes Turkey, Japan, US, UK, Germany and France, between January 1999 and December 2007. He used Co-Integration and DSUR (Dynamic Seemingly Unrelated Regression) Frameworks, with monthly interest and exchange rate values. Results showed that nominal interest rates explain exchange rate volatility for equations which include Turkey during the 1999-2007 periods. However, between 1985 and 1998, findings are favorable only between France and Germany. The general conclusion was that the exchange rate volatility is caused by other additional factors besides nominal interest rate differentials.

Stephen (2014) did a study on the effect of interest rate differential on the foreign exchange rate in East African forex market. His objective was to verify on whether interest rate parity and PPP models hold among EAC three countries such as Kenya, Uganda and Tanzania. The methodology used was to apply a multiple linear regression analysis on monthly real exchange rates as dependent variable, and real interest rate differentials, relative inflation rate, relative deficit/surplus rate as independent variables, all the information for a period starting from January 2009 to July 2014. The regression results revealed an unclear relationship between real interest differentials and real exchange rates in the East African forex market because real interest differentials contributed for only 10% in the variation of the real exchange rates.

Emil (2002) carried a study on the empirical investigation of the IFE, where the main objective was to test the probability that nominal interest differentials can offset volatility in exchange rates in the long term, between US (as the home country) and five countries that are Canada, UK, Sweden, Germany and Japan.

The regression method used was Ordinary Least Square which was applied on quarterly nominal interest differentials of the five countries relative to US interest rates, and quarterly change in exchange rates for the same countries relative to the USD, all the information between 1993 and 2000. The results showed that change in exchange rate is explained by nominal interest differentials only between United States and Japan.

Lungu and Johannes (2014) evaluated the relationship between interest rate and exchange rate in Namibia. They applied a Vector Autoregressive (VAR) approach to quarterly data all information between 1993 and 2012. Their findings proved that the relation between exchange rates and interest rates is not systematically clear as all variables of the study were not cointegrated. Therefore, the variance decomposition disclosed moreover that the errors in the forecast of the rate of exchange and rate of interest are dominated by itself and an insignificant percentage is also assigned to other variables.

Francisco and Razzak (1999) evaluated the long-run relationship between nominal interest rate differential and nominal exchange rate, for USD as home currency against the DEM, GBP, JPY, and the CAD. They used monthly rates of interest established in bond market rather than those in money market, for the period from 1980 to 1997. The regression analysis revealed that nominal exchange rates are significantly related to nominal interest differentials in the cases of CAD-USD and JPY-USD.

Siti and Eno (2009) regressed data for a five-years period (2003-2008) to test the validity of IFE between Indonesia (home country) and United States, Japan, Singapore, and the United Kingdom (foreign countries). Exchange rate change was taken as independent variable while interest rate differential was the dependent variable. They employed quarterly and yearly data and the results indicated that the difference in interest rates affects positively the exchange rate changes for United States, Singapore, and United Kingdom comparative to that of Indonesia; but that effect is not significant.

However, the effect of interest rate differentials was negative and significant for Japan. This means that IFE held (although statistically insignificant) for United States, Singapore and UK pairing with Indonesia, whereas it didn't hold for Japan pairing with Indonesia.

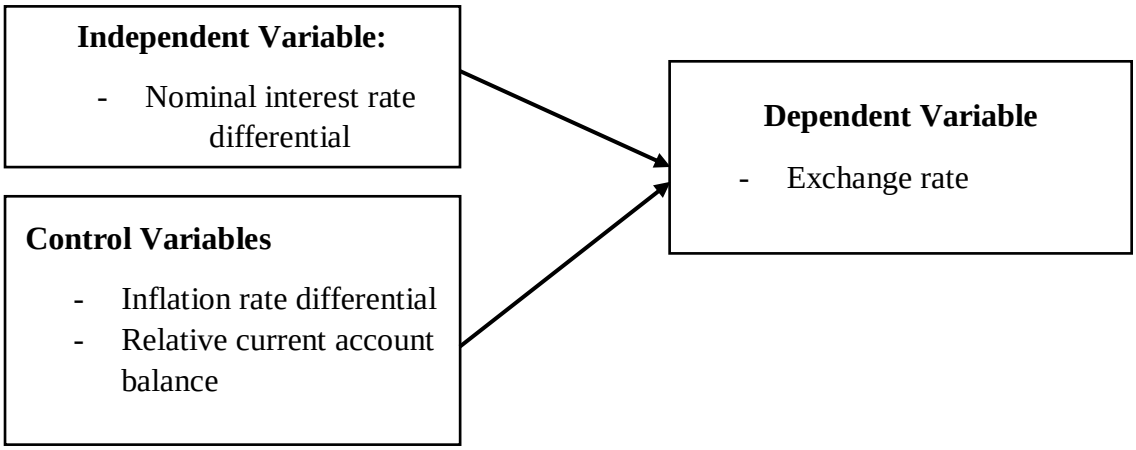
Even if the theoretical and empirical literatures prove that interest rate differentials and exchange rate volatility are related, the conclusion is not definite as findings are mixed. Some studies argued that the relation is negative for short terms and positive for long terms. In addition, most studies were done between developed countries and few in developing countries like EAC area; this gap forms the basis for this study.

2.5. Conceptual Framework

In a research, the conceptual framework shows the idea of the researcher about how he will explore the research problem. Specifically, it concretizes the direction by which a given study is supposed to be undertaken. In short, a conceptual framework demonstrates the relationship between the independent variable(s) and the dependent variable.

The conceptual model of our study constitutes nominal interest rate differential as independent variable and exchange rate as dependent variable. Inflation differential and relative current account balance are the control variables.

Figure: Conceptual Framework



This study seeks to test on whether nominal interest rate differentials can determine the exchange rate volatility of EAC currencies. Nominal interest rate differential is the main explanatory variable and exchange rate is the dependent variable.

2.6. Summary of Literature Review

Theoretically and empirically, the literature validates that relationship between interest rate differentials and volatility in exchange rates. However, there is no precise conclusion on such relation as findings are mixed for different studies, which even makes confusions on whether exchange rates move in the same direction with interest rate differentials or not. Some studies support that the relation between these variables is positive in the long-run. For instance, Francisco and Razzak (1999), Emil (2002), Ersan (2008), and Hacker et al, (2010) used different methods but arrived at the same conclusion that interest rate differentials were positively related to exchange rate volatility, even if this could not hold for all pairs of the countries studied. The same conclusion had been found before in other related studies (Mussa, 1979; Frenkel, 1976; Bilson, 1979) which contended that variation in interest rate differentials reflects variations in expected inflation differentials or the expected rate of currency depreciation.

So, a rise of home interest rate implies a rise of the expected inflation. Investors will reduce their demand for the home currency, thus leading to its depreciation.

Contrary, studies like the one of Siti and Eno (2009) proved a negative relation between the two variables among some pairs of countries. This is also supported by Dornbusch (1976) and Frankel (1979) who found that rise in the home rates of interest attracts foreign capital and then causes the home currency to appreciate. Other studies argue that interest rate differentials and exchange rates are not clearly connected (Stephen, 2014; Lungu & Johannes, 2014).

Nevertheless, the inconsistency in previous studies about the effect of interest rate differentials on exchange rate volatility may due to various factors that can lead to exchange fluctuations such as exchange regimes that are being implemented, or other factors like balance of payments problems, foreign exchange supply and demand, monetary policy, speculations, national income, rising in inflation and interest rate (Khalwaty, 2000). The fact that some studies support that differences in interest rates and exchange rates are negatively related while other maintain a positive relationship need an empirical verification in the case of EAC currencies. In addition, most studies were done between developed countries 'currencies and few in developing countries like EAC area, which is another gap that forms the basis for our study.

CHAPTER THREE: METHODOLOGY

3.1. Introduction

This chapter outlines the procedures and methodologies that were tackled in order to show the relationship between the nominal interest rate differentials and exchange rate changes among EAC partner states. Definitely, this section covers the research design, population, data collection and data analysis.

3.2. Research Design

In this study, a descriptive method was used to describe theories of interest rate differentials and exchange rates volatility. Appropriate financial literatures that link interest rate differential and exchange rate change such as PPP, FE, and IFE were employed. Regarding the empirical analysis, a statistical test was utilized to historical nominal interest rate differentials and exchange rate changes of EAC currencies. It focused on testing whether future exchange rates can be anticipated the by the use of nominal interest rate differentials among countries. Average monthly exchange rates and nominal interest differentials among the five countries were considered between January 2013 and December 2017.

3.3. Population and Sample

The target population of this research is East African Community Currencies. The study deals with monthly exchange rates and money market interest rates of the five EAC partner states such as Kenya, Uganda, Burundi, Tanzania and Rwanda. South Sudan was excluded from the sample as it has joined the community recently in April 2016 when possibilities of convergence in exchange rate regimes and inflation rates had already been implemented within the community.

Therefore, including it in the sample may not match the impact of economic decisions already made by all governments. Our study covers the period of five years, from January 2013 to December 2017.

3.4. Data Collection

The study used secondary data for all variables. Monthly exchange rates, money market interest rates, inflation rates, and current account balances of the five EAC countries were collected from the available main sources such as reports of countries' Central Banks, national bureaus of statistics, World Bank and the International Monetary Fund.

Secondary data is the second hand data that is gathered from already existing materials such as books, peer-reviewed journal articles, websites and other relevant materials (Saunders, Thornhill & Lewis, 2007). Countries' nominal interest rates aided in computing interest differentials obtained by subtracting the foreign interest rates from the domestic interest rates.

3.5. Data Analysis

There are some assumptions that are required to be made about the data before the use of any regression model.

3.5.1. Diagnostic Tests

Before the regression of the model, a unit root test was undertaken to verify whether the study variables are stationary. Stationarity test enables to check if the mean and variance of the time series are time invariant. In this study, such test was verified through the estimation of Augmented Dickey Fuller (ADF) and Phillips-Person (PP) unit root tests, Levin, Lin and Chu test (LL), Im, Pesaran and Shin W-stat (IPS).

The study did also test of multicollinearity which aids to verify whether there is a linear relationship between independent variables. The presence of multicollinearity in a time series can prevent the analysis from coming up with reliable estimates of individual coefficients of independent variables.

With regard to panel data, various authors assert that autocorrelation test is not important, given that these data combine both temporal and individual dimensions. This test is mostly recommended for time series.

3.5.2. Econometric Model

To analyze the effect of interest rate differential on the exchange rate volatility, this study employed a panel data regression for the following country pairs: Kenya/Tanzania, Kenya/Uganda, Kenya/Burundi, Kenya/Rwanda, Tanzania/Uganda, Tanzania/Burundi, Tanzania/Rwanda, Uganda/Burundi, Uganda/Rwanda, and Burundi/Rwanda. Therefore, this study analyzed how the exchange rate among different currency pairs is affected by their nominal interest differentials. Other variables to be included in the model are relative inflation rates, and relative current account balances. In this study, it is assumed a nonlinear relationship between the dependent variable and the explanatory variables and that the parameters are heterogeneous. By heterogeneity, it means that the parameters of the model are explicitly allowed to vary across country pairs.

Therefore, the model of this study was developed as follows:

$$Y_{it} = \alpha + \beta_1 Int_{it} + \beta_2 Inf_{it} + \beta_3 Cab_{it} + \varepsilon_{it}$$

Where;

Y_{it} is the average monthly exchange rate between currency pairs i at time t.

Int_{it} is the nominal interest rate differential between home and foreign one month maturity T-bills i at time t.

Inf_{it} is inflation rate differential i between home and foreign country at time t.

Cab_{it} is the relative current account balance i between home and foreign country at time t. However, Rwanda and Uganda do not release monthly publication on the Balance of Payments. Therefore, Uganda quarterly current accounts were computed into monthly data, and Rwanda yearly current accounts were also computed into monthly basis.

α is the intercept.

$\beta_1, \beta_2, \beta_3,$ are the slope coefficients and they are all hypothesized to be positive.

ε_{it} is the error term.

3.5.3. Test of Significance

The significance of the model was tested through the coefficient of determination R^2 and t-student. R^2 is one of the measures of goodness of fit of a regression model. It indicates the total variation of the dependent variable in percentage due to the existence of the explanatory variable. The value of R^2 varies between 0 and 1, and we conclude that the independent variable do not explain the variation of the dependent variable if R^2 tends to 0. However, if R^2 tends to 1, it means that the variation of the dependent variable is a function of explanatory variable. According to the R^2 adjusted (R^{-2}), it is adjusted to degrees of freedom and increases with the explanatory power of the model. It decreases with the losses in degrees of freedom. Generally, if the equation is well specified, the values of the two statistics, R^2 and R^{-2}, are close. The t-test or t-student test helps to analyze the significance of an independent variable when taken individually. Therefore, a t-test on all coefficients at 5% level of significance was applied and it helps to know the acceptance region of their critical t-values (Gujarati, 1988).

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1. Introduction

This chapter addresses the study objective through the presentation and discussion of the data analysis, findings and interpretations on the collected data. The aim is to assess the effect of interest rate differential on the exchange rate volatility of EAC currencies. The chapter also presents descriptive statistics, charts, and regression analysis.

Monthly data was collected for five years (January, 2013 – December, 2017) from the Central Bank of Kenya, Bank of Uganda, Bank of the Republic of Burundi, Bank of Tanzania, National Bank of Rwanda, and the IMF e-Library. The data used was monthly average exchange rates of KES/TZS, KES/UGX, KES/BIF, KES/RWF, TZS/UGX, TZS/BIF, TZS/RWF, UGX/BIF, UGX/RWF, BIF/RWF, and nominal interest rate differentials, inflation rate differentials, and relative current account balances among country pairs.

4.2. Descriptive Statistics

This part provides a description of variables that were utilized to describe how the exchange rate of EAC currencies is related to interest rate differential between countries. Results are given in tables and graphs.

4.2.1. Kenya versus Tanzania, Uganda, Burundi, and Rwanda

The table 4.1 below shows some descriptive statistics on the variables' relationship for Kenya as home country, and other four countries taken as foreign countries.

Table 4.1: Descriptive Statistics – Kenya vs Tanzania, Uganda, Burundi, and Rwanda

Kenya and Tanzania				
	KES/1TZS	*INT*	*INF*	*CAB*
Mean	0.049	-3.78	0.68	-4477
Median	0.048	-3.455	1.13	-4449
Standard Deviation	0.003	2.993	2.38	683.16
Minimum	0.044	-9.6	-7.26	-5912
Maximum	0.054	7.3	5.62	-3161
N	60	60	60	60

Kenya and Uganda			
KES/1UGX	*INT*	*INF*	*CAB*
0.031	-3.36	1.78	-4604
0.031	-2.48	1.59	-4574
0.002	2.984	1.9	696.43
0.028	-10.5	-1.43	-6008
0.035	0.53	6.38	-3296
60	60	60	60

Kenya and Burundi			
KES/1BIF	*INT*	*INF*	*CAB*
0.06	-1.173	-1.22	-4716
0.059	-1.41	-0.08	-4749
0.004	2.8962	4.17	720.66
0.053	-7.78	-11.9	-6127
0.068	10.69	4.56	-3295
60	60	60	60

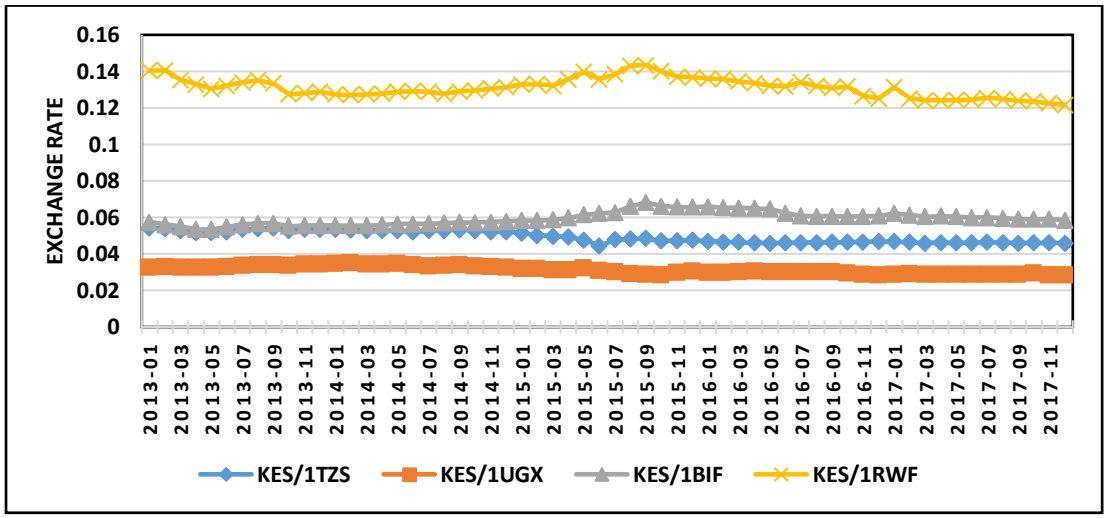
Kenya and Rwanda			
KES/1RWF	*INT*	*INF*	*CAB*
0.131	3.21	1.4	-4651
0.131	3.695	0.83	-4701
0.005	3.611	3.35	729.27
0.122	-4.02	-5.98	-6040
0.143	18.21	9.2	-3196
60	60	60	60

Source: Research data

The above results show that the kenya shilling appreciated against the other currencies over the five years with a low of KES = 0.044/TZS, KES = 0.028/UGX, KES = 0.053/BIF, KES = 0.122/RWF in 2013 and a high of KES = 0.054/TZS, KES = 0.035/UGX, KES = 0.068/BIF, KES = 0.143/RWF in year 2017. The mean exchange rates recorded during the period are KES = 0.049/1TZS, KES = 0.031/1UGX, KES = 0.06/1BIF, and KES = 0.131/1RWF.

In summary, from the descriptive statistics of the above country pairs, an increase in interest rate differential resulted to the increase of Kenya shilling exchange rates at minimum and maximum.

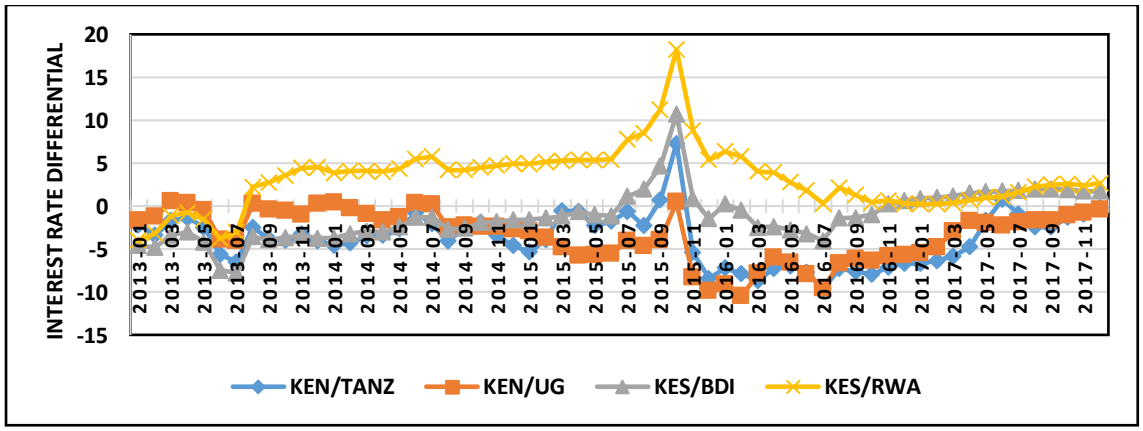
Figure 4.1: Trend of Monthly Exchange Rates – KES/TZS, KES/UGX, KES/BIF, KES/RWF



Source: Research data

The results in figure 4.1 show that the movement of KES against TZS and BIF was rising but at low level since 2013 up to October, 2014; where the KES appreciated considerably against the TZS and depreciated against the BIF. From September, 2015, the exchange rate of KES/TZS and KES/BIF regain their normal trends. However, the movement of KES/UGX was in slight rise for the whole period of study, which means that the Kenya shilling appreciated against the Uganda shilling. Also, the KES appreciated against the RWF in a normal trend.

Figure 4.2: Trend of Interest Rate Differentials – Kenya/Tanzania, Kenya/Uganda, Kenya/Burundi, Kenya/Rwanda



Source: Research data

The above figure 4.2 shows that the interest rate differentials between Kenya and the four other countries recorded an erratic movement from 2013 to 2017 with a considerable minimum of -10.48 in February 2016 between Kenya and Uganda, and a maximum of 18.21 in October 2015 between Kenya and Rwanda. In short, the above graphs show that there is some periods in which the Kenya interest rate was relatively high and others in which it was relatively low.

4.2.2. Tanzania versus Uganda, Burundi, and Rwanda

The table 4.2 below shows some descriptive statistics on the variables' relationship for Tanzania as home country, Uganda, Burundi, and Rwanda as foreign countries.

Table 4.2: Descriptive Statistics – Tanzania vs Uganda, Burundi, and Rwanda

Tanzania and Uganda				
	TZS/1UGX	*INT*	*INF*	*CAB*
Mean	0.626	0.422	1.1	-127
Median	0.624	0.99	0.48	-131
Standard Deviation	0.017	2.478	2.402	168
Minimum	0.585	-6.82	-2.13	-537
Maximum	0.657	5	8.4	378
N	60	60	60	60

Tanzania and Burundi			
TZS/1BIF	*INT*	*INF*	*CAB*
1.847	2.61	-1.892	-238.8
1.971	2.21	-0.355	-244.9
0.281	3.03	5.064	183.21
1.013	-2.4	-14.98	-722.7
2.146	7.55	5.76	252.4
60	60	60	60

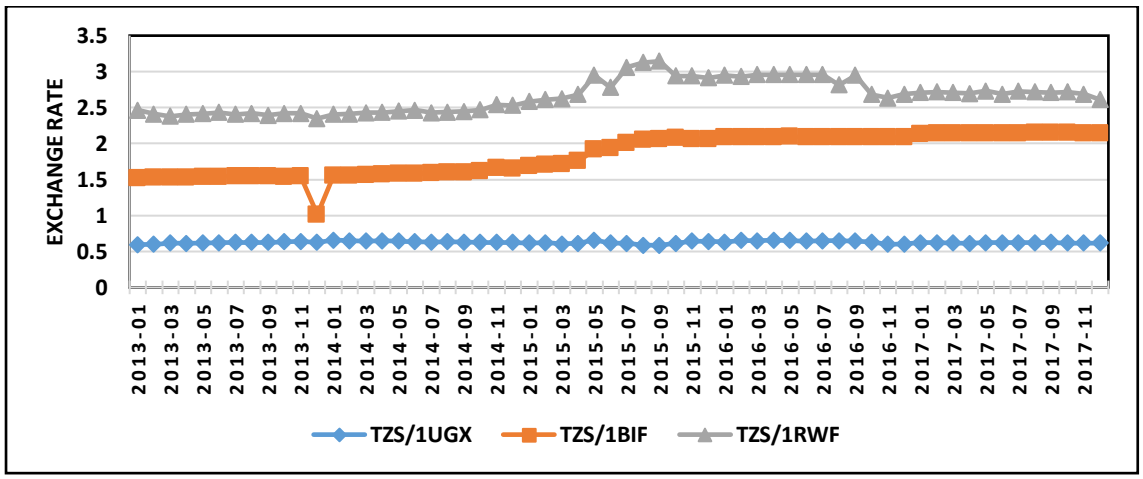
Tanzania and Rwanda			
TZS/1RWF	*INT*	*INF*	*CAB*
2.66	6.99	0.723	-174
2.681	7.46	0.995	-172
0.225	3.622	3.821	191.9
2.347	-1.84	-7.92	-689
3.145	14.19	8.96	340.2
60	60	60	60

Source: Research data

The above table 4.2 shows that the Tanzania shilling appreciated against the UGX with a low of TZS = 0.585/1UGX and a high of TZS = 0.657/1UGX. However, the Tanzania shilling depreciated against BIF and RWF with a low of TZS = 1.013/1BIF, TZS = 2.347/1RWF and a high of TZS = 2.146/1BIF and TZS = 3.145/1RWF.

The mean exchange rates recorded during the study period are TZS = 0.626/1UGX, TZS = 1.847/1BIF, TZS = 2.66/1RWF. From the descriptive statistics of the above country pairs, an increase in independent variables (interest rate, inflation rate, current account) resulted to the increase of Tanzania shilling exchange rates at minimum and maximum.

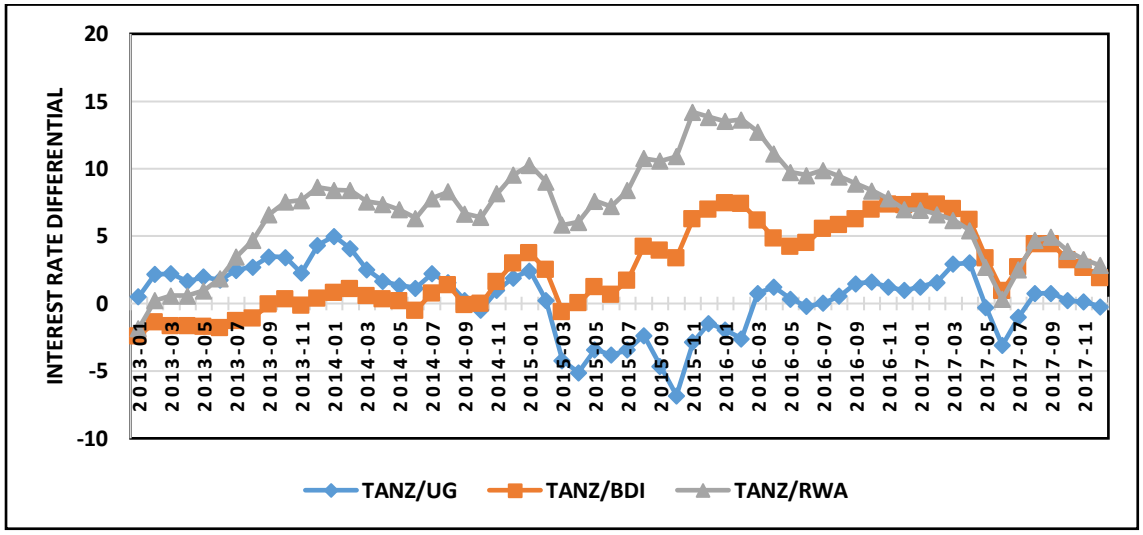
Figure 4.3: Trend of Monthly Exchange Rates – TZS/UGX, TZS/BIF, TZS/RWF



Source: Research data

From the figure 4.3, movement of Tanzania shilling against UGX was declining slightly for almost the whole period. This means that TZS appreciated against the UGX. Contrary, the trend of Tanzania shilling exchange rates against BIF and RWF was rising since 2013 to 2017, which means that the Tanzania shilling depreciated against the BIF and RWF.

Figure 4.4: Trend of Interest Rate Differentials – Tanzania/Uganda, Tanzania/Burundi, Tanzania/Rwanda



Source: Research data

The above figure 4.4 demonstrates a considerable fluctuation in interest rate differentials among country pairs. The erratic movement recorded among countries' interest differentials with a considerable minimum of -6.82 in October 2015 between Tanzania and Uganda, and a maximum of 14.19 in November 2015 between Tanzania and Rwanda.

4.2.3. Uganda versus Burundi and Rwanda

The table 4.3 below shows some descriptive statistics on the variables' relationship for Uganda as home country, Burundi and Rwanda as foreign countries.

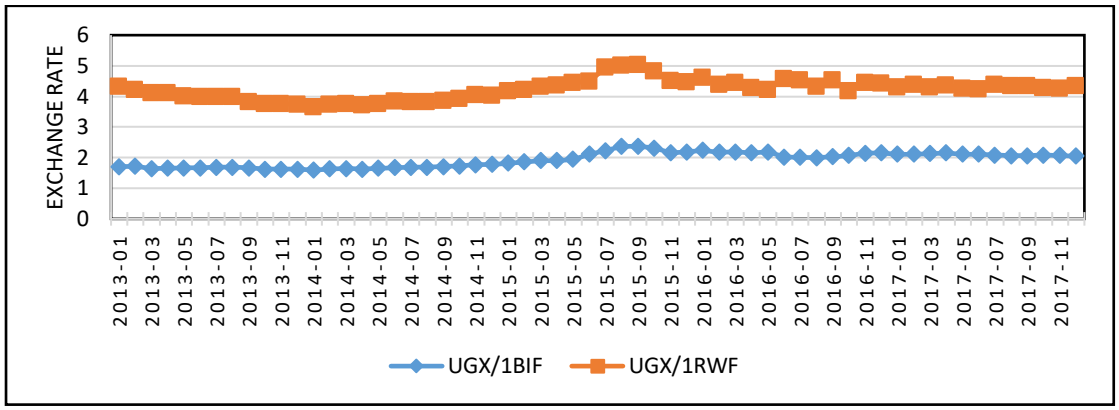
Table 4.3: Descriptive Statistics – Uganda vs Burundi and Rwanda

Uganda and Burundi				
	UGX/1BIF	*INT*	*INF*	*CAB*
Mean	1.929	2.1857	-2.9932	-112
Median	2.004	3.41	-2.195	-119
Standard Deviation	0.236	4.1916	4.71584	58.12
Minimum	1.59	-4.2	-15.22	-232
Maximum	2.37	10.22	3.09	16.1
N	60	60	60	60
Uganda and Rwanda				
	UGX/1RWF	*INT*	*INF*	*CAB*
Mean	4.214	6.5687	-0.377	-46.7
Median	4.264	5.715	0.03	-53.5
Standard Deviation	0.327	4.818	3.35195	70.58
Minimum	3.65	-2.35	-7.2	-170
Maximum	5.025	17.73	5.1	115
N	60	60	60	60

Source: Research data

From table 4.3, the Uganda shilling depreciated against the two other currencies, with a low of UGX = 1.59/1BIF, and UGX = 3.65/1RWF, while it depreciated with a high of UGX = 2.37/1BIF, and UGX = 5.025/1RWF. The mean exchange rates recorded during the study period are UGX = 1.929/1BIF, UGX = 4.214/1RWF. From the descriptive statistics of the above country pairs, an increase in independent variables (interest rate, inflation rate, current account) resulted to the increase of Uganda shilling exchange rates at minimum and maximum.

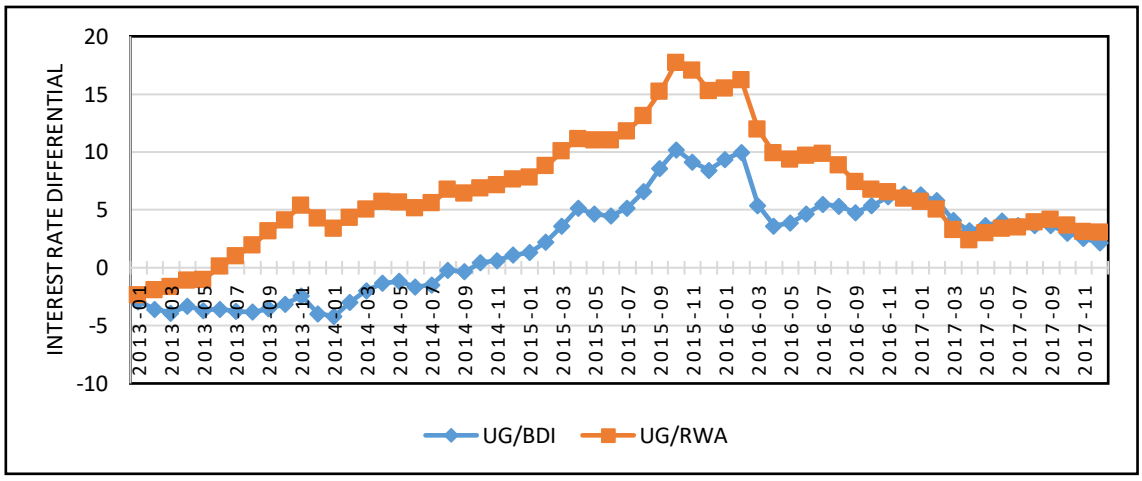
Figure 4.5: Trend of Monthly Exchange Rates – UGX/BIF, UGX/RWF



Source: Research data

The Uganda shilling depreciated considerably against BIF and RWF from 2013 to September, 2015 because the exchange rate movement was rising. After that period, movement of exchange rates was in declining until the end of 2017, which justifies a appreciation of the UGX.

Figure 4.6: Trend of Interest Rate Differentials – Uganda/Burundi and Uganda/Rwanda



Source: Research data

The trend of interest rate differentials between Uganda and Burundi and Rwanda were consistently rising from 2013 to October 2015. Contrary, the movement of interest differentials was decreasing since October, 2015 up to December, 2017. In short, the graph shows that Uganda interest rate was relatively high for the period 2013-2015 and relatively low from 2015 to the end of 2017.

4.2.4. Burundi and Rwanda

The table 4.4 below shows descriptive statistics on the variables' relationship for Burundi taken as home country, and Rwanda taken as foreign country.

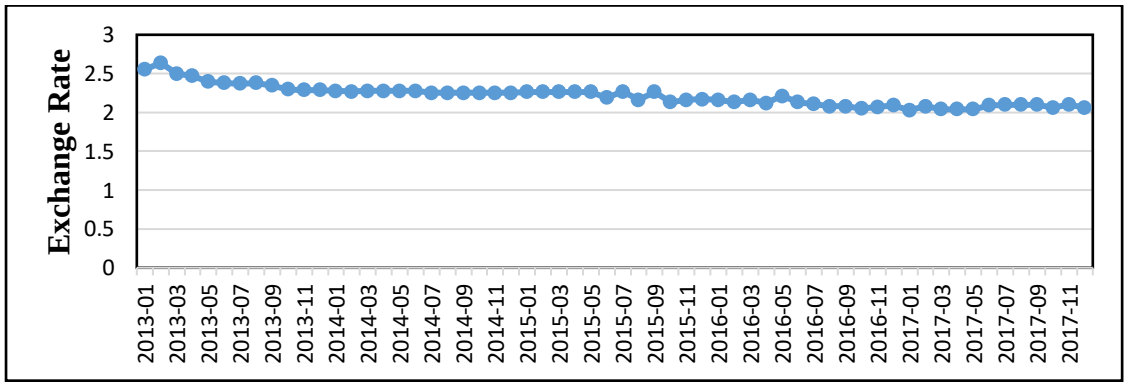
Table 4.4: Descriptive Statistics – Burundi and Rwanda

Burundi and Rwanda				
	BIF/1RWF	*INT*	*INF*	*CAB*
Mean	2.216279	4.3835	2.617	64.91192
Median	2.252252	6.16	1.73	61.6431
Standard Deviation	0.133272	3.022026	4.015788	25.09248
Minimum	2.028398	-0.84	-3.85	18.9305
Maximum	2.638522	8.26	13.79	99.5481
N	60	60	60	60

Source: Research data

The BIF appreciated against the RWF for the whole period of the study with a low of BIF = 2.028/1RWF, and a high of BIF = 2.638/1RWF. The period recorded a mean exchange rate of BIF = 2.216/1RWF with a standard deviation of 0.133. Descriptive statistics for interest rate differential recorded a minimum of -0.84 and a maximum of 8.26. Its median was at 6.16 while standard deviation recorded was 3.022 for the period of study.

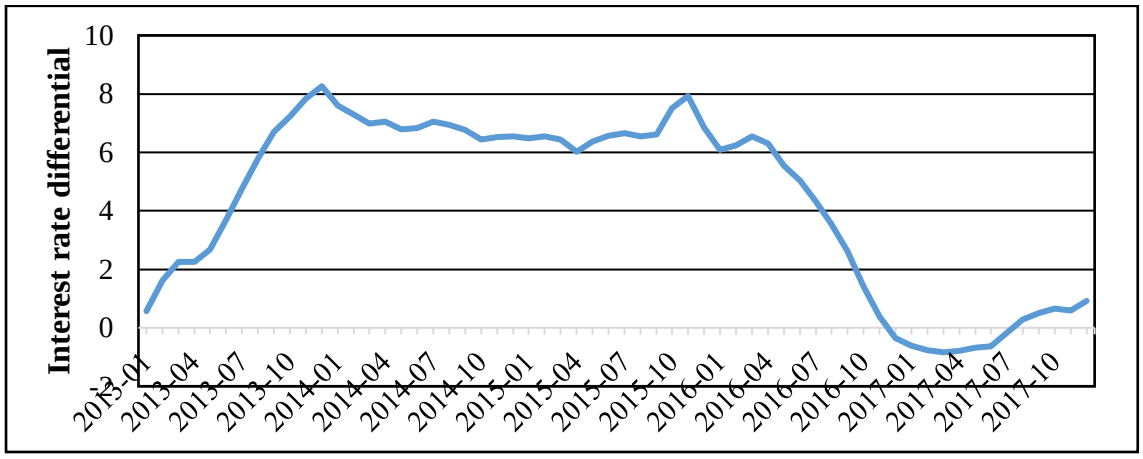
Figure 4.7: Trend of Monthly Exchange Rates – BIF/RWF



Source: Research data

The above graph support the descriptive statistic by showing that the trend of BIF exchange rate against RWF was declining for the whole period of the study, which means that on average the BIF appreciated against the RWF from 2013 to 2017.

Figure 4.8: Trend of Interest Rate Differentials – Burundi and Rwanda



Source: Research data

From the above graph, the interest rate differential between Burundi and Rwanda rose considerably between January and December 2013 with a maximum of 8.26; with a consistent drop from 2014 to 2017. This means that Rwanda interest rate was relatively high.

4.3. Regression Analysis

To analyze the effect of interest rate differentials on exchange rate volatility, a panel data regression model was done from the year 2013 to 2017, using the equation specified before i.e.

$$Y_{it} = \alpha + \beta_1 INT_{it} + \beta_2 INF_{it} + \beta_3 CAB_{it} + \varepsilon_{it}$$

Where;

Y_{it} is the average monthly exchange rate between currency pairs i at time t.

INT_{it} is the nominal interest rate differential between home and foreign one month maturity T-bills i at time t.

INF_{it} is inflation rate differential i between home and foreign country at time t.

CAB_{it} is the relative current account balance i between home and foreign country at time t.

α is the intercept.

$\beta_1, \beta_2, \beta_3$, are the slope coefficients.

ε_{it} is the error term.

4.3.1. Unit Root Tests

Unit root test enables to check whether regression series are stationary. This means that their mean and variance are time invariant. However, if the data is not stationary in level, it has to be differenced d times to make it stationary and then series are said to be integrated of order (d) and represented as I(d).

Table 4.5: Unit Root Tests (5% level)

Var.	Descr.	LL		IPS		ADF		PP	
		Level	1st. Diff	Level	1st. Diff	Level	1st. Diff	Level	1st. Diff
Y	t-stat.	-2.726	-25.69	-1.404	-24.136	33.77	357.38	20.89	362.62
	Prob.	0.0032	0.000	0.080	0.000	0.027	0.000	0.403	0.000
	stationary	**YES**	**YES**	**NO**	**YES**	**YES**	**YES**	**NO**	**YES**
INT	t-stat.	-1.723	-17.93	-2.156	-18.75	31.351	298.76	34.117	306.42
	Prob.	0.042	0	0.015	0	0.051	0	0.025	0
	stationary	**YES**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	**YES**
INF	t-stat.	-2.206	-17.23	-2.473	-17.21	34.642	268.39	34.684	265.66
	Prob.	0.013	0	0.006	0	0.022	0	0.021	0
	stationary	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
CAB	t-stat.	-2.121	-16.11	-3.594	-22.05	52.02	338.99	53.014	405.81
	Prob.	0.016	0	0	0	0	0	0	0
	stationary	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**

Source: Research data, from regression results with Eviews 8

The results above indicate that not all series are stationary in level, but they are all stationary in first difference. This means that all series are then integrated of order one I(1). Therefore, the next step consists of continuing the analysis by deciding between the Fixed - effects model and Random - effects model the one which can be considered as suitable model for the study. This is done through the Hausman test.

4.3.2. Hausman Test

Hausman test is a specification test to determine the best model to use between fixed and random models. These models differ from the correlation between individual effects and the explanatory variables. In panel data regression models, the fixed-effects model asserts that the specific effects can be correlated with explanatory variables. In the case of random-effects model, individual specific effects are random and cannot be added to the constant as dummy variables. These effects do not display any kind of correlation with the exogenous variables.

The two hypotheses of Hausman test are as follows:

H_0: Random-effects model is appropriate

H_1: Fixed-effects model is appropriate

When the probability value is statistically significant, fixed-effects model is used, otherwise we use the random-effects model.

Table 4.6: Hausman Test Results

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	**16.063076**	**3**	**0.0011**

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
INT	0.027396	0.027658	0.000000	0.0001
INF	-0.007598	-0.007490	0.000000	0.0035
CAB	0.000052	0.000058	0.000000	0.0004

Source: Research data, from regression results with Eviews 8

The above table shows that the probability associated with the Chi-Sq. Statistic is significant (0.000). Therefore, we reject the null hypothesis, and the good model to use in this analysis is Fixed-Effects model.

4.3.3. Fixed-Effects Model

The following table 4.7 provides results generated from the random-effects model.

Table 4.7: Estimation Results of Fixed - Effects model

Dependent Variable: Y				
Method: Panel EGLS (Cross-section random effects)				
Date: 10/25/18 Time: 22:30				
Sample: 2013M01 2017M12				
Periods included: 60				
Cross-sections included: 10				
Total panel (balanced) observations: 600				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.428333	0.026144	54.63299	0.0000
INT	0.027396	0.001774	15.44070	0.0000
INF	-0.007598	0.001681	-4.520020	0.0000
CAB	5.24E-05	1.35E-05	3.891519	0.0001
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.988742			
Adjusted R-squared	0.988512			
S.E. of regression	0.146510			
F-statistic	4296.105			
Prob(F-statistic)	0.0000			

Source: Research data, from regression results with Eviews 8

Results from the above table approve that the fixed-effect model is good. Its adjusted coefficient of determination (Adjusted $R^2 = 0.988$) is much greater than 50%. This means that the variation of dependent variable (exchange rate) is explained by the independent variables taken together at 98.8%. The probability of F-statistic is also significant (0.000). From the above results, it is found that all independent variables are statistically significant at the 5% level.

The estimated coefficients substituted from the above table 4.7 are as follows:

Y = 1.428 + 0.027*INT - 0.0075*INF + 0.000052*CAB + ε

***Prob**: (0.0000) (0.0000) (0.0000) (0.0001)*

Therefore, the intercept value means that in any given month, the exchange rate between home and foreign currency will be 1.428 when all the predictor values are equal to zero. The coefficient of interest rate differential (INT) is positive and significant which means that ceteris paribus, an increase by one unit of interest rate differential corresponds to an increase of 0.027 units in the exchange rate change of East African Community currencies. This means that a relatively high interest rate in home country leads to its currency depreciation.

In the same equation, results show that Inflation differential (INF) has a negative significant effect on the exchange rate. Even though this negative effect was not expected, the regression results showed that increase by one unit of inflation rate differential corresponds to a decrease of 0.0075 units in the exchange rate change of East African Community currencies. This means that when the home country inflation rate is relatively high, it will lead to the same country's currency appreciation, which contradicts the economic theory. Contrary to this result, the theory supports that coefficient sign of INF should be negative because, an increase in inflation differential means that inflation rate is high in home country, and this would lead to home currency exchange rate depreciation.

Also, the relative current account (CAB) has a positive and significant effect on the exchange rate. An increase by 1 unit of the relative current account deficit in home country corresponds to an increase of 0.000052 units in the exchange rate of East African Community currencies.

Countries that import or spend more on foreign trade than what they export or earn from abroad, experience deficit current accounts. Consequently, it will need more foreign currency than it is getting from its exports. Excess of foreign currency demand decreases the home country's exchange rate (Taylor, 2001), thus the CAB coefficient sign should be negative in our study.

4.3.4. Collinearity Diagnostics

Collinearity is when two or more independent variables are linearly associated. Multicollinearity can be identified by the use of two collinearity diagnostic factors such as tolerance and the Variance Inflation Factor (VIF). Tolerance measures collinearity generated by SPSS and the tolerance of the variable is $1\text{-}R^2$. A tolerance value smaller than 0.1 must be investigated further. The following table shows the results generated by the multicollinearity diagnostic.

Table 4.8: Collinearity Statistics between Exchange Rates and Independent Variables

Model	Collinearity Statistics	
	Tolerance	VIF
INT	.766	1.305
INF	.979	1.021
CAB	.755	1.324

Source: Research data, from regression results with SPSS

The above table shows that tolerance values are greater than 1, which justifies that there is collinearity between the dependent variable and explanatory variables. Therefore, there is evidence to get rid of collinearity of the three explanatory variables; interest rate differential, inflation differential, and relative current account balance.

4.4. Discussion of Research Findings

From the descriptive analysis, the study found that Kenya shilling appreciated against other EAC currencies over the five years with the mean exchange rates of KES = 0.049/1TZS, KES = 0.031/1UGX, KES = 0.06/1BIF, and KES = 0.131/1RWF. The average monthly interest rate differentials between Kenya and the four other countries recorded an erratic movement from 2013 to 2017 with a considerable minimum of -10.48 in February 2016 between Kenya and Uganda, and a maximum of 18.21 in October 2015 between Kenya and Rwanda.

The Tanzania shilling appreciated against the UGX , while it depreciated against BIF and RWF with mean exchange rates of TZS = 0.626/1UGX, TZS = 1.847/1BIF, TZS = 2.66/1RWF. The average monthly interest differential fluctuated considerably among country pairs. The minimum of the movement was - 6.82 in October 2015 between Tanzania and Uganda, and the maximum was 14.19 in November 2015 between Tanzania and Rwanda.

In addition, Uganda shilling depreciated against BIF and RWF, with mean exchange rates of UGX = 1.929/1BIF, UGX = 4.214/1RWF. The average monthly interest rate differentials between Uganda and Burundi and Rwanda were consistently rising from 2013 to October 2015, and decreased since October, 2015 up to December, 2017.

In short, Uganda interest rate was relatively high for the period 2013-2015 and relatively low from 2015 to the end of 2017.

Finally, the BIF appreciated against the RWF for the whole period of the study with a mean exchange rate of BIF = 2.216/1RWF with a standard deviation of 0.133. Descriptive statistics for interest rate differential recorded a minimum of -0.84 and a maximum of 8.26.

From the regression analysis, results found from this study indicated that interest rate differential and relative current account deficit have positive and significant effects on the home country exchange rate volatility while inflation differential has negative and significant influence on domestic country's exchange rate change. From this study findings, it is concluded that an increase by 1 unit of interest differential between two countries will lead to the home currency's depreciation by 0.027 units, and that an increase by 1 unit of relative current account deficit will lead to the home currency's depreciation by 0.000052 units. These conclusions agree with various studies done under flexible-price approach. Hacker et al. (2010) carried out an empirical study on the relationship between the spot exchange rate and the interest rate differential (1993-2009) for seven pairs of countries, with a small country, Sweden, included in each of the cases. The methodology used was Wavelet Approach which consists of grouping time-series into various scales and helps to analyze them on a scale-by-scale basis. By using three-month interest rates, with monthly and quarterly spot exchange rates against the Swedish krona (SEK) of five major currencies (USD, JPY, Euro, GBP and SWF) and two other currencies (NOK, and KRW), findings showed the two variables are positively related for long-run periods more than one year.

Findings of this study also agree with Siti and Eno (2009) who regressed data for a five-years period (2003-2008) to test the validity of IFE between Indonesia (home country) and United States, Japan, Singapore, and the United Kingdom (foreign countries). Exchange rate change was taken as independent variable while interest rate differential was the dependent variable. They employed quarterly and yearly data and the results indicated that the difference in interest rates affects positively the exchange rate changes for United States, Singapore, and United Kingdom comparative to that of Indonesia, even if that effect was not significant.

The effect of current account deficit on the exchange rate agree with theories elaborated mostly in the 1970s and 1980s. Research of Dornbusch and Fisher (1980) found a causal relationship between current account and nominal exchange rate. Contrary, an empirical study done by Martin (2016) for a panel of 180 countries over the 1960 - 2007 period and found evidence for a reversed relationship, which holds especially in non-industrial countries – flexible exchange rate arrangements deliver a faster current account adjustment.

The study revealed also a negative significant relationship between inflation differential and home currency exchange rates with a coefficient value of -0.0075 and p-value = 0.000. But, this effect contradicts what the inflation differential theory suggests. As we are using direct quotation of exchange rate in this study, a negative effect means the appreciation of the home currency. The conclusion is that when inflation differential is considered individually, it is unable to explain the exchange rate change between two currencies. Actually, exchange rates are likely affected by other variables that might not have been included in regression, and which caused the opposite sign of inflation differential coefficient.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

In this study, the aim was to examine the effect of interest rate differentials on the exchange rate volatility of EAC currencies. The data used was average monthly KES/TZS, KES/UGX, KES/BIF, KES/RWF, TZS/UGX, TZS/BIF, TZS/RWF, UGX/BIF, UGX/RWF and BIF/RWF exchange rates (in direct quotation), average monthly interest rate differentials between Kenya and Tanzania, Kenya and Uganda, Kenya and Burundi, Kenya and Rwanda, Tanzania and Uganda, Tanzania and Burundi, Tanzania and Rwanda, Uganda and Burundi, Uganda and Rwanda, Burundi and Rwanda. Inflation rate differentials and relative current account balances between the above country pairs were also considered from January 2013 to December 2017. Secondary data was collected from the central banks of the five countries and from IMF e-Library. Therefore, this chapter synthesizes the summary of findings, conclusions found, recommendations and suggestions for further study.

5.2. Summary of Findings

To investigate the effect of interest rate differentials and exchange rate volatility of EAC currency, the dependent variable was the exchange rate, while nominal interest rate differential, relative current account balance and inflation differential were considered as independent variables. The study time frame was from January 2013 to December 2017 and a Panel Data regression model was used. The study revealed that all variables are stationary in first order difference. The Hausman test revealed that fixed-effects model is the suitable model for the study analysis. Therefore, it was found that 98.8% change in the exchange rate is explained by the independent variables taken together.

The study revealed indeed that the exchange rate and interest rate differential are related positively and significantly with a coefficient value of 0.027 and p-value = 0.000, which means that in East African Community a rise of interest rate differential by 1 unit will lead to an increase of 0.027 units in the exchange rate change. The implication is that a country with high relative interest rate will see its currency depreciated.

It was also found that the relative current account balance has a positive and significant effect on the exchange rate with a coefficient value of 0.000052 and p-value = 0.0001. Econometrically, this implies that increase by 1 unit of the relative current account deficit in home country corresponds to an increase of 0.000052 units in the exchange rate of East African Community currencies. The study further revealed a negative significant effect of inflation differential on the exchange rate with a coefficient value of -0.0075 and p-value = 0.000. However, this result opposes the inflation differential theory which under the PPP theory asserts that the coefficient sign of inflation should be positive. The reason for this unfortunate result may be from the limitation encountered during the data collection especially on current account balance of Rwanda and Uganda, which is not published on monthly basis and that led us to computed yearly and quarterly current accounts into monthly data. Thus, this might have affected the study regression results.

5.3. Conclusion

The study analyzed the effect of interest rate differentials on the exchange rate volatility of East African Community currencies with specific country pairs such as between Kenya/Tanzania, Kenya/Uganda, Kenya/Burundi, Kenya/Rwanda, Tanzania/Uganda, Tanzania/Burundi, Tanzania/Rwanda, Uganda/Burundi, Uganda/Rwanda and Burundi/Rwanda.

Average monthly interest rate differential, inflation differential, and relative current account balance, all information from January 2013 to December 2017 were considered for each country pair. The study findings revealed a positive significant relationship between the exchange rate and two independent variables – nominal interest rate differential and relative current account balance. Ceteris paribus, an increase by 1 point in interest differential leads to an increase by 0.027 points of the exchange rate and a rise of 1 point in the relative current account corresponds to an increase of exchange rate by 0.000052 points. The implication of such conclusion is that in EAC countries with relatively high interest rates will their currencies depreciating and also countries with relatively high current account deficit will have depreciated currencies.

However, the study concluded that there is a negative significant relationship between exchange rate and inflation differential. This result contradicts the inflation differential theory given under the PPP theory. In fact, PPP asserts that countries with relatively high inflation rates should see their currencies depreciating, which is different in this study case. The fact that Rwanda and Uganda do not publish the Balance of Payments' data on monthly basis might have affected the results adequacy.

In addition, EAC countries have some differences whether economically, geographically, etc. It is reasonable for big country like Kenya to have a very high current account balance than Burundi. So, their current account differentials may bring some confusion about how it can affect the two countries' currency exchange rates.

In nutshell, more than 98% of the variation in the dependent variable was attributed to the three independent variables, and interest rate differential takes the main place to influence the exchange rate volatility as its coefficient (0.027) is greater than the ones of inflation differential and relative current account balance

5.4. Recommendations

The study recommends that EAC regulators should continue trying to find all possible means to adjust levels of main macroeconomic variables such as inflation, interest rates, etc., and exchange rates management, all these in order to reach the exchange rates convergence leading to monetary union aimed by EAC partner states. This effort can help to minimize the effect that exchange rates volatility can have on EAC economies, as it can benefit investors to anticipate future returns of their current investment decisions. Also, fluctuations in exchange rates put developing countries into a higher exposition to external shocks and lower liquidity of their currencies in international markets.

The study recommends further that EAC central banks should come up with the same format of data publications in order to facilitate researchers or evaluators to get periodic information easily. For example, Rwanda and Uganda should update their way of data release, perhaps align themselves with the Bank of Tanzania mode of data publication.

However, there is a possibility that the characteristic of results found is due to the methodology used or country pairs that were considered in the data analysis. The unfortunate coefficient's sign associated with the inflation differential can be mitigated may be if the topic is tested using another methodology and changing the type of country pairs. It can also be solved by changing the time frame by choosing other periods and reanalyzing the data.

5.5. Limitations of the Study

The study encountered some limitations. It found an unexpected coefficient sign of the variable inflation differential. Assumptions of the theory (IFE) referred to in the study analysis have some limitations.

The PPP justifies that expected inflation can be measured by the comparison of nominal interest rate and real interest rate, but this is not always true for every country.

Theories show that the rate of inflation is the one that commands the interest rate in any country, but it seems that what causes exchange rate volatility in a given country is not only inflation. Some other elements like level of income and government control can also influence it significantly.

Another limitation of this study occurred during the data collection step. The study was unable to get monthly current account balance data for Rwanda and Uganda. Uganda releases quarterly data while Rwanda releases only yearly data on that variables. Therefore, it was necessarily to compute these data into a monthly basis by dividing by 12 each Rwanda yearly current account balance and by 3 each Uganda quarterly current account balance. It is true that these computations have affected the regression outcome.

Indeed, the study faced a limitation in the development of the statistical representation of data. Since the research was conversant with Eviews version 3.1 program which is not efficient in testing some assumptions of Panel data, this required some training on the software Eviews version 8 and SPSS V.20 to facilitate to proper generation of results.

5.6. Areas of Further Research

The study suggests that further research can be done on the same topic with other methodologies. This study assumed that there is no arbitrage in exchange rates among different countries which means that the spot exchange rate between two currencies was the same in home country and foreign country regardless other factors that be considered to adjust exchange rates. Therefore, further research can be done by taking into account exchange rates as published by each central bank. In such perspective, the analysis can be doubled by considering each country as home and foreign country respectively.

The effect of interest rate differential on exchange rate can also behave differently if all country pair's data are regressed in a panel model and if each country pair is analyzed on its own. The significance may be different if variables are regressed from one country pair to another. Therefore, other studies can use other methods like Error Correction Model and regress separately the effect of interest rate differential on the exchange rate between Kenya and Tanzania, Kenya and Uganda, Kenya and Burundi, Kenya and Rwanda, Tanzania and Uganda, Tanzania and Burundi, Tanzania and Rwanda, Uganda and Burundi, Uganda and Rwanda, Burundi and Rwanda.

In addition, the study results showed that other factors apart from interest rate, inflation and current account balance affect the exchange rates in EAC foreign exchange market. Therefore it is envisaged that future scholars and researchers will investigate into details the effects of other elements like relative level of income, government control, relative employment rate, relative corruption index, relative tax rate, political situation, market judgment and speculation among others. The study further suggested that more research be carried out by changing the time frame of the analysis to deepen more information of literature on relationship between interest rate differential and exchange rate.

REFERENCES

Aliber, R. Z., & Stickney, C. (1975). Accounting measures of foreign exchange exposure: the long and short of it. *Accounting Review,* 50(1), 44-57.

Anita, M. (2013). Analysis of macroeconomic determinants of exchange rate volatility in India. *International Journal of Economics and Financial Issues,* 3 (1), 172-179.

Baron, D. P. (1976). Fluctuating exchange rates and the pricing of exports. *Economic Inquiry*, *14*, 425-38.

Broll, U. (1994). Foreign production and forward markets. *Australian Economic Papers*, *33*, 1-6.

Carlos, C. B. (2005). *The exchange rate-interest differential relationship in six East Asian countries.* University of the Philippines. College of Business Administration.

Caruana, J. (2011). Capital flows to the emerging market economies: a perspective on policy challenges. *Forty-sixth SEACEN Governors' Conference,* 24-26, February. Colombo, Sri Lanka.

Cassel, G. (1918). Abnormal deviations in international exchanges. *The Economic Journal*, 28, 413-415.

Christopher, S. A., Pantaleo, K., Camillus, K., & Stephen, A. O. (2012). *Exchange rate arrangements in the transition to east African monetary union.* International Growth Center. Oxford University.

Clark, & Peter, B. (1973). Uncertainty, exchange risk, and the level of international trade. *Western Economic Journal,* 11, 302-13

Demirag, I., & Goddard, S. (1994). *Financial management for international business*. Berkshire, and Europe: McGraw-Hill Book Company.

Dornbusch, & Rudiger. (1976). Expectations and exchange rate dynamics. *Journal of Political Economy,* 84, 1161-1176.

Dornbusch, R. and Fischer, S. (1980). Exchange Rates and the Current Account. *The American Economic Review,* 70(5), pp. 960-971.

Ebiringa, O. T., & Anyaogu, N. B. (2014). Exchange rate, inflation and interest rates relationships: an autoregressive distributed lag analysis. *Journal of Economics and Development Studies,* 2(2), 263-279.

Emil, S. (2002). *An empirical investigation of the international fisher effect*. Thesis, Lulea University of Technology. Social Science and Business Administration Programs.

Engle, R. F., & Granger, C. W. J. (1987). *Co-Integration and error correction: representation, estimation and testing*, Econometrica, 55, 251-276.

Ersan, E. (2008). *International fisher effect: a reexamination within the cointegration and dsur frameworks.* Thesis, Middle East Technical University. School of Social Sciences.

Fama, E.F. (1975). Short term interest rates as predictors of inflation. *American Economic Review,* 65, 269-282.

Fama, Eugene, F., & Andre, F. (1979). Money, bonds and foreign exchange. *American Economic Review,* 69, 639-649.

Fisher, I. (1930). *The theory of interest.* New York: Macmillan.

Francisco, N.D., & Razzak, W.A. (1999). Nominal exchange rates and nominal interest rate differentials. *International Monetary Fund,* WP/99/141.

Frankel, J. (1979). On the Mark: A theory of floating exchange rates based on real interest differentials. *American Economic Review,* 69, 610-622.

Frankel, J. (1984). Tests of monetary and portfolio balance models of exchange rate determination. *In John Bilson and Richard Marston, eds., Exchange Rate Theory and Practice, Chicago (*239-260*),* University of Chicago Press for NBER.

Frenkel, J. A. (1976). A monetary approach to the exchange rate: doctrinal aspects and empirical evidence. *Scandinavian Journal of Economics,* 78, 200-224.

Furman, J., & Stiglitz, J. E. (1998). Economic crises: evidence and insights from East Asia. *Brooking Papers on Economic Activity 2,* Washington D.C.

Gailliot, H. J. (1971). Purchasing power parity as an explanation of long-term changes in exchange rates. *Journal of Money, Credit and Banking*, 2 (3), 348-57.

Ghosh, S. R. (2010). Dealing with the challenges of capital inflows in the context of macro financial link. *World Bank: Poverty Reduction and Economic Management Network, 19,* Washington.

Gujarati, D. N. (1988). *Basic econometrics (2nd ed.).* McGraw-Hill Book Company, New York.

Gujarati, D. N. (2003). *Basic econometrics (4th ed*.). McGraw-Hill Higher Education. United States Military Academy, West Point.

Hacker, S. R., Huynjoo, K., & Kristofer, M. (2010). The relationship between exchange rate and interest rate differentials: a wavelet approach. *CESIS. Paper No 217*, The Royal Institute of Technology.

Honohan, P., & Lane, P. R. (2003). Divergent inflation rates in EMU. *Economic Policy,* 18.

Honohan, P., & Lane, P. R. (2004). Exchange rates and inflation under EMU: an update. *CEPR. Discussion Paper No. 4583*.

Hooper, Peter, & Steven, W. K. (1978). The effect of exchange rate uncertainty on the prices and volume of international trade. *Journal of International Economics,* 8, 483-511.

Ibrahim, A., Elbadawi, & Raimundo, S. (2005). Theory and empirics of real exchange rates in Sub-Saharan Africa and other developing countries. *World Bank, Washington DC.*

Jamal, A. M. M. (2005). A nonlinear model of exchange rates: Some recent evidence. *International Journal of Management*, 22 (2), 189.

Jemma, D., & Anh, D. (2017). Inflation convergence in East African countries. *International Monetary Fund,* Bank of Lithuania.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics,* 52, 169-209.

Kane, E., & Rosenthal, L. (1982). International interest rates and inflationary expectations. *Journal of international money and finance.* 1, 97-110.

Khalwaty, & Tajul. (2000). *Inflation and solutions* (1st ed.). Gramedia Pustaka Utama, Indonesia.

Kim, B. J. C., & Mo, S. (1995). Cointegration and the long-run forecast of the exchange rate. *Economics Letters,* 48, 353-359.

Krugman, P. R., & Obstfeld, M. (1997). *International economics*. Addison Wesley Longman, Inc. Harlow, England.

Krugman, P. R., Obstfeld, M., & Melitz, M. J. (2011). *International economics*: *theory and policy*. Pearson Education.

Luiz, F. P., Fernando, F. F., & Aline, M. G. (2012). *Capital flows, international imbalances and economic policies in Latin America*. Economic Policies, Governance and the New Economics: Palgrave Macmillan.

Lungu, W. (2014). The relationship between interest rate and exchange rate in Namibia. *Journal of Emerging Issues in Economics, Finance and Banking*, 3(1).

Madura, J. (2010). *International financial management* (10th ed.). South-Western College Publishing.

Maeso, F., Osbat, C., & Schnatz, B. (2002). Determinants of the euro real effective exchange rate: A BEER/PEER approach. *Australian Economic Papers*, 41(4), 437- 461.

Martin, F. E. (2016). Exchange rate regimes and current account adjustment: An empirical investigation. *Journal of International Money and Finance*, 65, pp. 69-93.

Maurice, K. S. (2012). A test of the international fisher effect in selected Asian countries. *International Journal of Humanities and Social Science*, Columbus State University, 2 (4).

McNown, R., & Wallace, M. (1994). Cointegration tests of the monetary exchange rate model for three high-inflation countries. *Journal of Money, Credit, and Banking*, 26, 396 - 411.

Menzie, C. (2011). *Macro approaches to foreign exchange determination.* University of Wisconsin and NBER

Menzie, C., & Hiro, I. (2007). Price based measurement of financial globalization: a cross country study of interest rate parity. *Pacific Economic Review*, 12 (4), 419-444.

Mishkin, F. S. (1992). Is the fisher effect for real? A reexamination of the relationship between inflation and interest rates. *Journal of Monetary Economics*, 30, 195-215.

Mussa, M. (1979). Empirical regularities in the behavior of the exchange rates and theories of the foreign exchange market. *In Karl Brunner and Allan Meltzer, (eds.), Policies for Employment, Prices, and Exchange Rates. Carnegie – Rochester Conference*, Vol.2, Amsterdam: North Holland

Nathan, S. (2006). Interest rate differentials in a small open economy – long run relationship, the Israeli case. *Financial Stability Area*, Bank of Israel.

Nwosa, P. I., & Amassoma, D. (2014). Capital inflows and exchange rate in Nigeria. *Mediterranean Journal of Social Sciences*, 5 (7).

Patterson, B., & Lygnerud, K. (1999). The determination of interest rates. *European Parliament L-2929*, Luxembourg.

Rashid A., & Husain, F. (2010). Capital inflows, inflation and exchange rate volatility: an investigation for linear and nonlinear causal linkages. *Pakistan Institute of Development Economic, Islamabad*. PIDE Working Papers: 63.

Robinson, W., & Warburton, P. (1980). *Managing currency holdings: lessons from the floating period.* London business school, economic outlook. February.

Salas, O., Andrea, G.M., & Rodrigo (2015). Finding international fisher effect to determine the exchange rate through the purchasing power parity theory: the case of Mexico during the period 1996-2012. *Applied Econometrics and International Development*, 15(1), 98-110.

Sargent, T. J., & Wallace, N. (1981). Some unpleasant monetarist arithmetic. *Federal Reserve Bank of Mineapolis: Quarterly Review*, 5: 1-17

Saunders, M., Thornhill, A., & Lewis, P. (2007). *Research methods for business students* (4th ed.). Pearson Education.

Shapiro, A. C. (1998). *Foundations of multinational financial management*. Prentice-Hall, Inc. London.

Shapiro, A. C., & Atulya, S. (2009). *Foundations of multinational financial management* (6th ed.). New Jersey: John Wiley & Sons, Inc.

Simone, M., & Maxwell, O. (2017). Exchange rate dynamics and monetary integration in the EAC countries. *Toulouse School of Economics.* Working Papers No 17-848. September.

Siti, R. U., & Inanga, E. L. (2009). Exchange rates, interest rates, and inflation rates in Indonesia: the international fisher effect theory. *International Research Journal of Finance and Economics*, ISSN 1450-2887 Issue 26 (2009).

Solnik, B. (2000). *International investments*. Addison Wesley Longman, Inc. New York.

Solnik, B., Roll, & Richard (1979). On some parity conditions encountered frequently in international economics. *Journal of Macroeconomics*, 1, 267-283.

Stephen, S. M. (2014). *The Effect of Interest Rate Differential on the Foreign Exchange Rate in East African Forex Market*. Thesis, University of Nairobi.

Taylor, J.T. (2001). The Role of the Exchange Rate in Monetary Policy Rules. *American Economic Review, Papers and Proceedings*, 91, 263-267.

Webster, A. (1987). *Purchasing power parity as a theory of international arbitrage in manufactured foods: an empirical view of UK/USA prices in the 1970s*. Applied Economics.

World development indicators (2015 & 2016). *World Bank.*

APPENDICES

APPENDIX 1: Monthly Data Kenya and Tanzania

Month	Y (KES/1TZS)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	0.054	-2.18	-7.26	-4242.8
2013-02	0.054	-3.42	-5.92	-4375.2
2013-03	0.053	-1.69	-5.66	-4296.2
2013-04	0.052	-1.36	-5.24	-4464.7
2013-05	0.052	-2.49	-4.29	-4455.2
2013-06	0.052	-5.66	-2.73	-4388.2
2013-07	0.053	-6.5	-1.52	-4331.4
2013-08	0.054	-2.49	-0.07	-4429.2
2013-09	0.054	-3.87	2.23	-3907.5
2013-10	0.053	-4	1.44	-4552.1
2013-11	0.054	-3.25	1.12	-4226.9
2013-12	0.054	-4.09	1.59	-4425.1
2014-01	0.054	-4.57	1.18	-4202.2
2014-02	0.053	-4.31	0.87	-4104.9
2014-03	0.053	-3.49	0.19	-3856.2
2014-04	0.053	-3.36	0.12	-4077
2014-05	0.053	-2.64	0.81	-4470.8
2014-06	0.052	-0.81	0.98	-4493.9
2014-07	0.053	-2.06	1.14	-4719.7
2014-08	0.053	-4.09	1.66	-4924.9
2014-09	0.053	-2.48	-0.03	-5372.1
2014-10	0.053	-1.92	0.55	-5398
2014-11	0.052	-3.42	0.24	-5546.9
2014-12	0.052	-4.62	1.27	-5163.8
2015-01	0.052	-5.35	1.55	-5278.1
2015-02	0.050	-3.91	1.43	-5440.2
2015-03	0.050	-0.55	2.04	-5370.9
2015-04	0.049	-0.66	2.63	-5912.4
2015-05	0.048	-2.28	1.55	-5691.4
2015-06	0.044	-1.78	0.9	-5664.2
2015-07	0.048	-0.61	0.17	-5160.3
2015-08	0.048	-2.29	-0.52	-4932
2015-09	0.049	0.68	-0.11	-5119

2015-10	0.047	7.3	0.39	-4100.6
2015-11	0.047	-5.44	0.71	-4722.6
2015-12	0.047	-8.44	1.17	-4389.2
2016-01	0.047	-7.2	1.25	-3764.8
2016-02	0.047	-7.89	1.2	-3736.4
2016-03	0.046	-8.67	1.02	-3694.2
2016-04	0.046	-7.24	0.19	-3378.8
2016-05	0.046	-6.97	-0.2	-3291.5
2016-06	0.046	-7.73	0.29	-3302.3
2016-07	0.046	-9.6	1.29	-3239.5
2016-08	0.046	-7.27	1.4	-3584.2
2016-09	0.046	-7.62	1.87	-3470.9
2016-10	0.046	-7.95	1.96	-3161.7
2016-11	0.047	-7.12	1.88	-3360.9
2016-12	0.047	-6.68	1.31	-3712.7
2017-01	0.047	-6.7	1.82	-4266.6
2017-02	0.046	-6.37	3.84	-4443.6
2017-03	0.046	-5.84	3.89	-4426.2
2017-04	0.046	-4.74	5.06	-4549.8
2017-05	0.046	-1.7	5.62	-4637.8
2017-06	0.046	0.78	3.77	-4614.8
2017-07	0.046	-0.9	2.3	-4880.4
2017-08	0.046	-2.43	3.03	-4966.3
2017-09	0.046	-2.45	1.79	-4955.2
2017-10	0.046	-1.32	0.64	-5085.2
2017-11	0.046	-0.92	0.3	-4992.4
2017-12	0.046	-0.18	0.53	-4915.2

Source: Central Bank of Kenya, Bank of Tanzania, IMF e-Library

APPENDIX 2: Monthly Data Kenya and Uganda

Month	Y (KES/1UGX)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	0.032	-1.67	0.22	-4373
2013-02	0.033	-1.25	2.49	-4561
2013-03	0.033	0.53	1.24	-4482
2013-04	0.033	0.3	1.09	-4653.2
2013-05	0.033	-0.51	0.19	-4587.2
2013-06	0.033	-3.91	-0.4	-4520.2
2013-07	0.034	-4.03	0.04	-4463.4
2013-08	0.034	0.24	-0.27	-4535.4
2013-09	0.034	-0.39	0.84	-4444.4
2013-10	0.034	-0.56	1.09	-4917.1
2013-11	0.034	-0.98	1.53	-4711.1
2013-12	0.034	0.23	1.69	-4662.1
2014-01	0.034	0.44	1.92	-4464.2
2014-02	0.035	-0.25	2.06	-4390.2
2014-03	0.034	-0.95	1.06	-4281.2
2014-04	0.034	-1.71	2.11	-4412.7
2014-05	0.035	-1.29	3.82	-4704.7
2014-06	0.034	0.35	4.83	-4710.7
2014-07	0.033	0.16	5.21	-4781
2014-08	0.034	-2.53	6.38	-4932
2014-09	0.034	-2.24	5.01	-5401.5
2014-10	0.033	-2.39	4.9	-5681.1
2014-11	0.033	-2.43	4.1	-5746.1
2014-12	0.033	-2.72	3.96	-5488.1
2015-01	0.032	-2.92	1.55	-5408.9
2015-02	0.032	-3.66	2.84	-5552.9
2015-03	0.031	-4.79	3.18	-5614.9
2015-04	0.031	-5.77	2.55	-5950.1
2015-05	0.032	-5.69	2.05	-5860.1
2015-06	0.031	-5.59	2.09	-6008.1
2015-07	0.030	-4.03	1.21	-5560
2015-08	0.029	-4.64	0.17	-5139.1
2015-09	0.029	-3.97	-1.16	-4741
2015-10	0.028	0.48	-1.43	-4197.4
2015-11	0.030	-8.31	-1.24	-4465.6

2015-12	0.030	-9.91	-0.96	-4160.5
2016-01	0.030	-9.14	-0.17	-3969.3
2016-02	0.030	-10.48	-0.7	-3746.9
2016-03	0.030	-7.89	-0.46	-3687.4
2016-04	0.030	-6.03	-0.41	-3641.3
2016-05	0.030	-6.62	-0.8	-3448.1
2016-06	0.030	-7.92	-0.6	-3495.5
2016-07	0.030	-9.55	0.75	-3295.5
2016-08	0.030	-6.71	0.98	-3556
2016-09	0.030	-6.14	2.12	-3441
2016-10	0.030	-6.35	2.59	-3311.3
2016-11	0.029	-5.89	2.34	-3455.7
2016-12	0.028	-5.7	1.2	-3656
2017-01	0.029	-5.46	1.62	-4183.7
2017-02	0.029	-4.81	3.11	-4442.8
2017-03	0.029	-2.91	4.43	-4544
2017-04	0.029	-1.72	5.22	-4552.5
2017-05	0.028	-2	4.98	-4716.2
2017-06	0.029	-2.31	3.34	-4729.3
2017-07	0.029	-1.88	2.26	-4888.8
2017-08	0.029	-1.68	3.25	-4971
2017-09	0.029	-1.68	2.21	-4970.6
2017-10	0.029	-1.09	1.15	-5087.6
2017-11	0.028	-0.79	1	-5000.2
2017-12	0.028	-0.41	1.21	-4910.6

Source: Central Bank of Kenya, Bank of Uganda, IMF e-Library

APPENDIX 3: Monthly Data Kenya and Burundi

Month	Y (KES/1BIF)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	0.058	-4.58	-3.89	-4483.7
2013-02	0.056	-4.81	-4.97	-4696.1
2013-03	0.055	-3.37	-2.77	-4573.6
2013-04	0.053	-3.03	0.52	-4812.7
2013-05	0.054	-4.2	-2.16	-4766
2013-06	0.055	-7.47	-4.82	-4669.7
2013-07	0.056	-7.78	-3.57	-4643.4
2013-08	0.057	-3.57	-1.55	-4733.5
2013-09	0.057	-3.94	-1.37	-4630.2
2013-10	0.055	-3.68	0.48	-5040.9
2013-11	0.056	-3.42	-0.92	-4832.8
2013-12	0.056	-3.73	-1.87	-4802.7
2014-01	0.056	-3.76	1.21	-4612.5
2014-02	0.056	-3.21	0.99	-4558.4
2014-03	0.056	-2.91	2.51	-4438.5
2014-04	0.056	-3.04	1.63	-4572.2
2014-05	0.056	-2.44	3.86	-4854.2
2014-06	0.057	-1.31	4.07	-4880.5
2014-07	0.057	-1.29	4.56	-5002.1
2014-08	0.057	-2.72	2.49	-5155.6
2014-09	0.057	-2.58	1.12	-5633.9
2014-10	0.057	-1.93	2.93	-5766.7
2014-11	0.058	-1.8	1.93	-5847.4
2014-12	0.058	-1.62	2.27	-5564.7
2015-01	0.058	-1.58	2.06	-5532.4
2015-02	0.058	-1.41	4.49	-5657.5
2015-03	0.059	-1.16	1.6	-5726.5
2015-04	0.060	-0.64	-0.39	-6069.5
2015-05	0.062	-1.04	-0.32	-5979.5
2015-06	0.062	-1.12	-0.62	-6127.6
2015-07	0.063	1.13	-1.37	-5685.5
2015-08	0.066	1.94	1.61	-5264.7
2015-09	0.068	4.63	1.82	-4866.6
2015-10	0.066	10.69	1.11	-4349.4
2015-11	0.066	0.84	1.52	-4617.8

2015-12	0.066	-1.48	0.9	-4312.8
2016-01	0.066	0.25	1.43	-3985.6
2016-02	0.065	-0.49	0.16	-3781.5
2016-03	0.065	-2.49	2.17	-3722
2016-04	0.065	-2.42	2.65	-3665.9
2016-05	0.065	-2.76	2.3	-3472.7
2016-06	0.062	-3.24	1.92	-3520.1
2016-07	0.061	-4.04	2.45	-3422.9
2016-08	0.061	-1.41	-0.38	-3683.4
2016-09	0.061	-1.36	-0.67	-3568.5
2016-10	0.061	-0.99	0.49	-3295.2
2016-11	0.061	0.25	-0.44	-3439.7
2016-12	0.061	0.65	-3.2	-3640
2017-01	0.062	0.86	-5.87	-4238.2
2017-02	0.061	1	-11.14	-4476.6
2017-03	0.061	1.19	-10.79	-4577.9
2017-04	0.061	1.49	-8.03	-4646.2
2017-05	0.060	1.65	-7.11	-4810
2017-06	0.060	1.72	-5.79	-4823.1
2017-07	0.060	1.81	-6.06	-4994.9
2017-08	0.060	1.96	-5.88	-5077.1
2017-09	0.059	1.98	-8.3	-5076.7
2017-10	0.059	1.93	-11.86	-5182.5
2017-11	0.059	1.75	-10.63	-5095.1
2017-12	0.059	1.74	-5.46	-5005.5

Source: Central Bank of Kenya, Bank of the Republic of Burundi, IMF e-Library

APPENDIX 4: Monthly Data Kenya and Rwanda

Month	Y (KES/1RWF)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	0.140	-4.02	-5.98	-4445.6
2013-02	0.141	-3.2	-3.56	-4633.6
2013-03	0.135	-1.12	-1.31	-4554.6
2013-04	0.133	-0.78	-1.39	-4779.6
2013-05	0.130	-1.53	-0.16	-4713.6
2013-06	0.132	-3.79	0.62	-4646.6
2013-07	0.134	-3.03	1.86	-4615.6
2013-08	0.135	2.2	2.9	-4687.6
2013-09	0.133	2.75	1.49	-4596.6
2013-10	0.127	3.55	0.81	-4994.6
2013-11	0.128	4.41	-0.19	-4788.6
2013-12	0.129	4.53	2.07	-4739.6
2014-01	0.127	3.84	3.56	-4565.4
2014-02	0.127	4.09	1.99	-4491.4
2014-03	0.127	4.07	-0.13	-4382.4
2014-04	0.128	4.01	1.62	-4511.4
2014-05	0.129	4.34	3.1	-4803.4
2014-06	0.129	5.51	2.91	-4809.4
2014-07	0.129	5.75	4.13	-4951.4
2014-08	0.128	4.21	5.02	-5102.4
2014-09	0.129	4.18	6.97	-5571.9
2014-10	0.130	4.49	8.48	-5718.4
2014-11	0.131	4.73	9.2	-5783.4
2014-12	0.131	4.92	6.45	-5525.4
2015-01	0.133	4.91	5.16	-5432.9
2015-02	0.133	5.13	5.39	-5576.9
2015-03	0.132	5.28	6.97	-5638.9
2015-04	0.136	5.39	5.85	-5981.9
2015-05	0.140	5.34	5.28	-5891.9
2015-06	0.136	5.43	6.05	-6039.9
2015-07	0.138	7.78	5.56	-5597.8
2015-08	0.143	8.48	3.68	-5176.9
2015-09	0.143	11.25	2.33	-4778.8
2015-10	0.140	18.21	1.26	-4261.6

2015-11	0.137	8.76	-0.18	-4529.8
2015-12	0.137	5.38	1.22	-4224.7
2016-01	0.136	6.34	1.2	-3905.3
2016-02	0.136	5.74	0.7	-3682.9
2016-03	0.134	4.06	0.61	-3623.4
2016-04	0.134	3.88	0.84	-3567.2
2016-05	0.132	2.77	0.62	-3374
2016-06	0.132	1.79	-0.47	-3421.4
2016-07	0.134	0.28	-1.41	-3324.1
2016-08	0.132	2.14	-1.24	-3584.6
2016-09	0.131	1.27	-1.09	-3469.6
2016-10	0.132	0.43	-2.67	-3196.3
2016-11	0.127	0.65	-2.47	-3340.7
2016-12	0.125	0.29	-4.7	-3541
2017-01	0.131	0.24	-5.01	-4176.9
2017-02	0.125	0.24	-4.08	-4436
2017-03	0.124	0.35	-2.68	-4537.2
2017-04	0.124	0.69	-1.4	-4605.5
2017-05	0.124	0.98	-0.02	-4769.2
2017-06	0.125	1.09	-0.22	-4782.3
2017-07	0.125	1.63	-0.59	-4954
2017-08	0.125	2.24	0.82	-5036.2
2017-09	0.124	2.48	0	-5035.8
2017-10	0.124	2.59	0.44	-5141.5
2017-11	0.123	2.35	3.16	-5054.1
2017-12	0.122	2.65	4.66	-4964.5

Source: Central Bank of Kenya, National Bank of Rwanda, IMF e-Library

APPENDIX 5: Monthly Data Tanzania and Uganda

Month	Y (TZS/1UGX)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	0.596	0.51	7.47	-130.23
2013-02	0.599	2.17	8.4	-185.83
2013-03	0.615	2.22	6.9	-185.83
2013-04	0.611	1.66	6.34	-188.5
2013-05	0.619	1.98	4.49	-132
2013-06	0.620	1.75	2.33	-132
2013-07	0.626	2.47	1.56	-131.95
2013-08	0.625	2.73	-0.2	-106.15
2013-09	0.627	3.48	-1.39	-536.85
2013-10	0.636	3.43	-0.35	-364.97
2013-11	0.641	2.27	0.41	-484.17
2013-12	0.625	4.33	0.11	-236.97
2014-01	0.655	5	0.74	-262
2014-02	0.646	4.06	1.19	-285.3
2014-03	0.641	2.54	0.87	-425
2014-04	0.649	1.66	1.99	-335.73
2014-05	0.646	1.35	3.01	-233.93
2014-06	0.637	1.16	3.85	-216.83
2014-07	0.631	2.23	4.07	-61.25
2014-08	0.636	1.56	4.73	-7.05
2014-09	0.630	0.24	5.05	-29.35
2014-10	0.624	-0.47	4.35	-283.13
2014-11	0.624	0.99	3.86	-199.23
2014-12	0.626	1.9	2.7	-324.33
2015-01	0.618	2.43	0	-130.79
2015-02	0.621	0.24	1.41	-112.69
2015-03	0.605	-4.24	1.14	-243.99
2015-04	0.613	-5.11	-0.08	-37.663
2015-05	0.656	-3.4	0.5	-168.66
2015-06	0.617	-3.81	1.19	-343.86
2015-07	0.614	-3.43	1.03	-399.66
2015-08	0.588	-2.36	0.69	-207.06
2015-09	0.585	-4.65	-1.05	378.037
2015-10	0.611	-6.82	-1.83	-96.793
2015-11	0.644	-2.87	-1.95	257.007

2015-12	0.638	-1.47	-2.13	228.707
2016-01	0.629	-1.95	-1.41	-204.52
2016-02	0.652	-2.59	-1.9	-10.523
2016-03	0.649	0.77	-1.48	6.7767
2016-04	0.657	1.22	-0.59	-262.46
2016-05	0.651	0.35	-0.6	-156.56
2016-06	0.642	-0.19	-0.89	-193.16
2016-07	0.648	0.04	-0.54	-56.043
2016-08	0.648	0.56	-0.41	28.157
2016-09	0.643	1.48	0.25	29.857
2016-10	0.631	1.6	0.62	-149.61
2016-11	0.601	1.22	0.46	-94.813
2016-12	0.603	0.99	-0.1	56.6867
2017-01	0.621	1.24	-0.2	82.92
2017-02	0.622	1.57	-0.72	0.82
2017-03	0.617	2.93	0.53	-117.78
2017-04	0.613	3.03	0.16	-2.66
2017-05	0.621	-0.3	-0.64	-78.36
2017-06	0.623	-3.09	-0.42	-114.46
2017-07	0.620	-0.98	-0.04	-8.443
2017-08	0.622	0.75	0.22	-4.743
2017-09	0.624	0.77	0.42	-15.443
2017-10	0.615	0.23	0.51	-2.443
2017-11	0.617	0.13	0.7	-7.843
2017-12	0.616	-0.22	0.69	4.557

Source: Bank of Tanzania, Bank of Uganda, IMF e-Library

APPENDIX 6: Monthly Data Tanzania and Burundi

Month	Y (TZS/1BIF)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	1.520	-2.4	3.36	-240.94
2013-02	1.524	-1.39	0.94	-320.85
2013-03	1.527	-1.68	2.89	-277.37
2013-04	1.527	-1.67	5.76	-348.04
2013-05	1.536	-1.71	2.13	-310.76
2013-06	1.538	-1.82	-2.09	-281.46
2013-07	1.548	-1.29	-2.05	-311.98
2013-08	1.546	-1.08	-1.48	-304.29
2013-09	1.541	-0.07	-3.6	-722.73
2013-10	1.536	0.32	-0.96	-488.76
2013-11	1.543	-0.16	-2.03	-605.92
2013-12	1.013	0.37	-3.45	-377.55
2014-01	1.550	0.81	0.04	-410.32
2014-02	1.555	1.1	0.12	-453.49
2014-03	1.565	0.58	2.32	-582.34
2014-04	1.567	0.32	1.51	-495.16
2014-05	1.577	0.2	3.05	-383.35
2014-06	1.582	-0.5	3.09	-386.59
2014-07	1.587	0.77	3.42	-282.42
2014-08	1.595	1.37	0.84	-230.68
2014-09	1.597	-0.11	1.16	-261.78
2014-10	1.616	-0.01	2.38	-368.66
2014-11	1.658	1.62	1.69	-300.48
2014-12	1.656	3	1.01	-400.9
2015-01	1.689	3.77	0.51	-254.34
2015-02	1.709	2.5	3.06	-217.33
2015-03	1.715	-0.61	-0.44	-355.6
2015-04	1.754	0.03	-3.02	-157.1
2015-05	1.916	1.25	-1.87	-288.13
2015-06	1.938	0.65	-1.52	-463.38
2015-07	2.004	1.73	-1.54	-525.23
2015-08	2.049	4.23	2.13	-332.67
2015-09	2.062	3.95	1.93	252.399
2015-10	2.079	3.39	0.72	-248.83

2015-11	2.062	6.27	0.81	104.779
2015-12	2.062	6.96	-0.27	76.432
2016-01	2.092	7.44	0.18	-220.79
2016-02	2.092	7.4	-1.04	-45.052
2016-03	2.092	6.18	1.15	-27.799
2016-04	2.092	4.82	2.46	-287.05
2016-05	2.096	4.21	2.49	-181.18
2016-06	2.092	4.49	1.63	-217.82
2016-07	2.092	5.56	1.15	-183.38
2016-08	2.088	5.86	-1.77	-99.232
2016-09	2.088	6.26	-2.54	-97.576
2016-10	2.088	6.97	-1.47	-133.51
2016-11	2.083	7.37	-2.31	-78.754
2016-12	2.083	7.33	-4.51	72.702
2017-01	2.132	7.55	-7.69	28.4153
2017-02	2.137	7.38	-14.98	-33.028
2017-03	2.137	7.02	-14.69	-151.67
2017-04	2.137	6.23	-13.09	-96.412
2017-05	2.141	3.36	-12.73	-172.15
2017-06	2.141	0.94	-9.56	-208.3
2017-07	2.141	2.71	-8.36	-114.45
2017-08	2.146	4.4	-8.91	-110.8
2017-09	2.146	4.43	-10.09	-121.54
2017-10	2.146	3.25	-12.5	-97.279
2017-11	2.141	2.67	-10.93	-102.72
2017-12	2.141	1.92	-5.98	-90.34

Source: Bank of Tanzania, Bank of the Republic of Burundi, IMF e-Library

APPENDIX 7: Monthly Data Tanzania and Rwanda

Month	Y (TZS/1RWF)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	2.463	-1.84	1.28	-202.84
2013-02	2.410	0.22	2.36	-258.44
2013-03	2.381	0.57	4.35	-258.44
2013-04	2.404	0.58	3.85	-314.94
2013-05	2.415	0.96	4.13	-258.44
2013-06	2.433	1.86	3.35	-258.44
2013-07	2.404	3.47	3.38	-284.24
2013-08	2.421	4.69	2.97	-258.44
2013-09	2.392	6.61	-0.74	-689.14
2013-10	2.421	7.54	-0.64	-442.54
2013-11	2.421	7.66	-1.3	-561.74
2013-12	2.347	8.62	0.48	-314.54
2014-01	2.404	8.41	2.38	-363.18
2014-02	2.410	8.4	1.12	-386.48
2014-03	2.427	7.56	-0.32	-526.18
2014-04	2.433	7.38	1.5	-434.38
2014-05	2.451	6.98	2.28	-332.58
2014-06	2.463	6.32	1.94	-315.48
2014-07	2.427	7.81	2.99	-231.68
2014-08	2.439	8.3	3.36	-177.48
2014-09	2.445	6.66	7	-199.78
2014-10	2.469	6.41	7.93	-320.38
2014-11	2.538	8.15	8.96	-236.48
2014-12	2.532	9.54	5.18	-361.58
2015-01	2.584	10.26	3.61	-154.79
2015-02	2.611	9.03	3.96	-136.69
2015-03	2.625	5.83	4.93	-267.99
2015-04	2.681	6.05	3.22	-69.491
2015-05	2.950	7.62	3.73	-200.49
2015-06	2.778	7.21	5.15	-375.69
2015-07	3.058	8.39	5.38	-437.49
2015-08	3.125	10.77	4.2	-244.89
2015-09	3.145	10.57	2.44	340.209
2015-10	2.941	10.91	0.87	-160.99

2015-11	2.941	14.19	-0.89	192.809
2015-12	2.915	13.82	0.05	164.509
2016-01	2.950	13.53	-0.05	-140.47
2016-02	2.933	13.63	-0.5	53.533
2016-03	2.959	12.73	-0.41	70.833
2016-04	2.959	11.13	0.65	-188.37
2016-05	2.959	9.74	0.82	-82.467
2016-06	2.959	9.52	-0.76	-119.07
2016-07	2.959	9.88	-2.7	-84.567
2016-08	2.817	9.41	-2.64	-0.367
2016-09	2.950	8.89	-2.96	1.333
2016-10	2.681	8.38	-4.64	-34.567
2016-11	2.632	7.77	-4.35	20.233
2016-12	2.688	6.97	-6	171.733
2017-01	2.710	6.94	-6.83	89.6967
2017-02	2.717	6.62	-7.92	7.5967
2017-03	2.710	6.19	-6.57	-111
2017-04	2.695	5.43	-6.46	-55.703
2017-05	2.732	2.69	-5.64	-131.4
2017-06	2.688	0.31	-3.99	-167.5
2017-07	2.725	2.53	-2.89	-73.603
2017-08	2.717	4.68	-2.21	-69.903
2017-09	2.710	4.93	-1.78	-80.603
2017-10	2.717	3.91	-0.2	-56.303
2017-11	2.688	3.26	2.86	-61.703
2017-12	2.611	2.83	4.13	-49.303

Source: Bank of Tanzania, National Bank of Rwanda, IMF e-Library

APPENDIX 8: Monthly Data Uganda and Burundi

Month	Y (UGX/1BIF)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	1.709	-2.91	-4.11	-110.71
2013-02	1.721	-3.56	-7.46	-135.02
2013-03	1.639	-3.9	-4.01	-91.543
2013-04	1.650	-3.33	-0.58	-159.54
2013-05	1.661	-3.69	-2.35	-178.76
2013-06	1.661	-3.56	-4.42	-149.47
2013-07	1.681	-3.76	-3.61	-180.03
2013-08	1.681	-3.81	-1.28	-198.14
2013-09	1.661	-3.55	-2.22	-185.88
2013-10	1.621	-3.12	-0.61	-123.79
2013-11	1.621	-2.43	-2.45	-121.75
2013-12	1.621	-3.96	-3.56	-140.58
2014-01	1.590	-4.2	-0.71	-148.32
2014-02	1.631	-2.96	-1.07	-168.19
2014-03	1.639	-1.96	1.45	-157.34
2014-04	1.621	-1.33	-0.49	-159.43
2014-05	1.650	-1.15	0.04	-149.42
2014-06	1.669	-1.66	-0.76	-169.76
2014-07	1.689	-1.46	-0.65	-221.17
2014-08	1.681	-0.19	-3.89	-223.63
2014-09	1.709	-0.34	-3.89	-232.43
2014-10	1.730	0.45	-1.97	-85.523
2014-11	1.770	0.63	-2.17	-101.24
2014-12	1.779	1.1	-1.69	-76.57
2015-01	1.821	1.34	0.51	-123.55
2015-02	1.859	2.25	1.65	-104.64
2015-03	1.901	3.63	-1.58	-111.61
2015-04	1.908	5.14	-2.94	-119.44
2015-05	1.949	4.65	-2.37	-119.46
2015-06	2.110	4.47	-2.72	-119.52
2015-07	2.232	5.16	-2.57	-125.57
2015-08	2.370	6.58	1.44	-125.6
2015-09	2.370	8.6	2.98	-125.64
2015-10	2.309	10.22	2.55	-152.03
2015-11	2.160	9.14	2.77	-152.23

2015-12	2.188	8.43	1.86	-152.28
2016-01	2.242	9.39	1.6	-16.267
2016-02	2.174	9.99	0.86	-34.529
2016-03	2.188	5.4	2.63	-34.576
2016-04	2.151	3.61	3.06	-24.586
2016-05	2.188	3.86	3.09	-24.621
2016-06	2.020	4.68	2.52	-24.659
2016-07	2.008	5.51	1.69	-127.34
2016-08	2.000	5.3	-1.36	-127.39
2016-09	2.028	4.78	-2.79	-127.43
2016-10	2.070	5.36	-2.1	16.1023
2016-11	2.141	6.14	-2.78	16.0593
2016-12	2.151	6.35	-4.41	16.0153
2017-01	2.119	6.32	-7.49	-54.505
2017-02	2.110	5.81	-14.26	-33.848
2017-03	2.132	4.09	-15.22	-33.894
2017-04	2.151	3.21	-13.25	-93.752
2017-05	2.119	3.65	-12.09	-93.793
2017-06	2.110	4.03	-9.13	-93.842
2017-07	2.079	3.69	-8.33	-106.01
2017-08	2.062	3.64	-9.13	-106.06
2017-09	2.062	3.66	-10.51	-106.1
2017-10	2.079	3.02	-13.01	-94.836
2017-11	2.070	2.54	-11.63	-94.873
2017-12	2.049	2.15	-6.67	-94.897

Source: Bank of Uganda, Bank of the Republic of Burundi, IMF e-Library

APPENDIX 9: Monthly Data Uganda and Rwanda

Month	Y (UGX/1RWF)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	4.310	-2.35	-6.2	-72.613
2013-02	4.202	-1.95	-6.05	-72.613
2013-03	4.098	-1.65	-2.55	-72.613
2013-04	4.115	-1.08	-2.49	-126.45
2013-05	4.000	-1.02	-0.35	-126.45
2013-06	3.984	0.12	1.01	-126.45
2013-07	3.984	0.99	1.82	-152.29
2013-08	3.984	1.96	3.17	-152.29
2013-09	3.817	3.14	0.65	-152.29
2013-10	3.745	4.11	-0.29	-77.576
2013-11	3.759	5.39	-1.71	-77.576
2013-12	3.731	4.3	0.37	-77.576
2014-01	3.650	3.41	1.64	-101.18
2014-02	3.731	4.35	-0.07	-101.18
2014-03	3.759	5.02	-1.19	-101.18
2014-04	3.704	5.72	-0.49	-98.649
2014-05	3.759	5.63	-0.73	-98.649
2014-06	3.831	5.16	-1.92	-98.649
2014-07	3.817	5.58	-1.08	-170.43
2014-08	3.802	6.74	-1.37	-170.43
2014-09	3.846	6.42	1.96	-170.43
2014-10	3.922	6.88	3.58	-37.246
2014-11	4.032	7.16	5.1	-37.246
2014-12	4.016	7.63	2.49	-37.246
2015-01	4.167	7.83	3.61	-24.001
2015-02	4.202	8.79	2.55	-24.001
2015-03	4.310	10.07	3.79	-24.001
2015-04	4.348	11.16	3.3	-31.828
2015-05	4.444	11.03	3.23	-31.828
2015-06	4.484	11.02	3.95	-31.828
2015-07	4.950	11.81	4.35	-37.828
2015-08	5.000	13.13	3.51	-37.828
2015-09	5.025	15.21	3.49	-37.828
2015-10	4.808	17.73	2.7	-64.198

2015-11	4.505	17.06	1.06	-64.198
2015-12	4.464	15.29	2.18	-64.198
2016-01	4.608	15.48	1.36	64.0563
2016-02	4.367	16.22	1.4	64.0563
2016-03	4.444	11.95	1.07	64.0563
2016-04	4.274	9.91	1.24	74.0963
2016-05	4.202	9.39	1.41	74.0963
2016-06	4.566	9.72	0.13	74.0963
2016-07	4.525	9.84	-2.16	-28.524
2016-08	4.310	8.85	-2.22	-28.524
2016-09	4.525	7.41	-3.21	-28.524
2016-10	4.167	6.78	-5.26	115.046
2016-11	4.444	6.55	-4.81	115.046
2016-12	4.425	5.98	-5.9	115.046
2017-01	4.292	5.71	-6.63	6.7767
2017-02	4.367	5.05	-7.2	6.7767
2017-03	4.292	3.25	-7.11	6.7767
2017-04	4.348	2.4	-6.61	-53.043
2017-05	4.255	2.98	-5.01	-53.043
2017-06	4.237	3.4	-3.56	-53.043
2017-07	4.367	3.51	-2.85	-65.16
2017-08	4.329	3.92	-2.42	-65.16
2017-09	4.329	4.16	-2.2	-65.16
2017-10	4.274	3.68	-0.71	-53.86
2017-11	4.255	3.13	2.16	-53.86
2017-12	4.329	3.06	3.45	-53.86

Source: Bank of Uganda, National Bank of Rwanda, IMF e-Library

APPENDIX 10: Monthly Data Burundi and Rwanda

Month	Y (UGX/1RWF)	INT (Interest Rate Differential)	INF (Inflation Rate Differential)	CAB (Relative Current Account Balance)
2013-01	2.551	0.56	-2.09	38.0938
2013-02	2.639	1.61	1.41	62.4035
2013-03	2.500	2.25	1.46	18.9305
2013-04	2.469	2.25	-1.91	33.0935
2013-05	2.398	2.67	2	52.3131
2013-06	2.381	3.68	5.43	23.0215
2013-07	2.370	4.75	5.43	27.7375
2013-08	2.381	5.77	4.45	45.844
2013-09	2.347	6.69	2.87	33.5915
2013-10	2.299	7.23	0.33	46.2123
2013-11	2.288	7.83	0.73	44.1752
2013-12	2.288	8.26	3.94	63.0031
2014-01	2.278	7.6	2.35	47.1388
2014-02	2.268	7.3	1	67.0118
2014-03	2.278	6.99	-2.64	56.1618
2014-04	2.278	7.05	-0.01	60.7768
2014-05	2.278	6.78	-0.76	50.7748
2014-06	2.278	6.82	-1.16	71.1089
2014-07	2.252	7.04	-0.43	50.7408
2014-08	2.252	6.93	2.52	53.2038
2014-09	2.252	6.77	5.85	62.0048
2014-10	2.252	6.43	5.55	48.2768
2014-11	2.252	6.53	7.27	63.9978
2014-12	2.252	6.54	4.18	39.3238
2015-01	2.262	6.49	3.1	99.5481
2015-02	2.262	6.54	0.9	80.639
2015-03	2.262	6.44	5.37	87.604
2015-04	2.262	6.02	6.24	87.609
2015-05	2.262	6.38	5.6	87.636
2015-06	2.188	6.56	6.67	87.691
2015-07	2.268	6.65	6.92	87.739
2015-08	2.160	6.54	2.08	87.775
2015-09	2.262	6.62	0.51	87.81
2015-10	2.132	7.51	0.15	87.835

2015-11	2.160	7.92	-1.71	88.03
2015-12	2.169	6.86	0.33	88.077
2016-01	2.160	6.09	-0.23	80.323
2016-02	2.132	6.23	0.54	98.585
2016-03	2.160	6.55	-1.56	98.632
2016-04	2.119	6.3	-1.81	98.682
2016-05	2.212	5.53	-1.68	98.717
2016-06	2.132	5.03	-2.39	98.755
2016-07	2.110	4.32	-3.85	98.813
2016-08	2.079	3.55	-0.86	98.865
2016-09	2.079	2.63	-0.42	98.909
2016-10	2.049	1.42	-3.16	98.944
2016-11	2.070	0.4	-2.03	98.987
2016-12	2.092	-0.36	-1.49	99.031
2017-01	2.028	-0.61	0.86	61.2814
2017-02	2.079	-0.76	7.06	40.6247
2017-03	2.041	-0.84	8.11	40.6707
2017-04	2.041	-0.8	6.64	40.7087
2017-05	2.041	-0.67	7.09	40.7497
2017-06	2.092	-0.63	5.57	40.7987
2017-07	2.101	-0.18	5.48	40.8467
2017-08	2.101	0.28	6.71	40.8947
2017-09	2.101	0.5	8.3	40.9387
2017-10	2.062	0.66	12.3	40.9757
2017-11	2.101	0.6	13.79	41.0127
2017-12	2.062	0.91	10.12	41.0367

Source: Bank of the Republic of Burundi, National Bank of Rwanda, IMF e-Library