EXCHANGE RATE AND INFLATION IN UGANDA FOR THE PERIOD 1990 - 2018

BY

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DECLARATION

I, **AYEBARE. COMFORT** the undersigned, hereby declare that the work contained in this research report is my original work and that it has not previously in its entirety or in part been submitted it to any university for a degree award.

Signature :.....CA.....Date.....05/July/2019...

AYEBARE. COMFORT

APPROVAL

This is to certify that this work has been under my supervision and is now ready for submission to the research committee of Kampala University, with my approval.

Signature …… Date…5/7/2019

MR. OKELLO MOSES

(SUPERVISOR)

DEDICATION

This study is dedicated to my dad Mr. Frank Kayongwe & Mrs. Tusingwire Margret my auncle Mr. Ahimbisibwe Harmlet and my aunt Mrs. Kyomugasho Hope. You have been an inspiration to me through your hard work, your commitment, your love for your child, and wisdom. without you, I would not be what I am.

Thank you.

MAY GOD BLESS U ALL

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Most importantly, I praise and thank God for the love, grace, strength and providence He has given me. I pray that He leads me yet again into the green pastures.

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LIST OF ACRONYMS

ADF	Augmented Dickey Fuller Test
LDCs	Less Developed Countries
BOU	Bank Of Uganda
COMESA	Common Markets for East and Southern Africa
CPI	Consumer Price Index
DRC	Democratic Republic Of Congo
EU	European Union
GDP	Gross Domestic Product
NAADS	National Agriculture Advisory Services
NER	Nominal Exchange Rates
PPP	Purchasing Power Parity
RER	Real Exchange Rate
UAE	United Arab Emirates
UBOS	Uganda Bureau of Statistics
USD	United States Dollar.

ABSTRACT

The effect of exchange rate on inflation of Uganda was studied from 1990 -2018 guided by the following specific objectives; to find out the relationship between nominal exchange rate and inflation rate in Uganda, to find out the relationship between real exchange rate and inflation rate in Uganda and to find out the causation between exchange rate and inflation in Uganda.

The study employed a descriptive research design which involved determining the relationships between the variables of the study by using regression analysis. Time series data of inflation, real exchange rate and nominal exchange rate and exchange rate was used as far as this study was concerned.

The findings of the study revealed that there is a positive relationship between exchange rate and inflation, the same was also for nominal exchange rate and inflation. This implies that as real exchange rate increases , inflation also increases .The multiple linear regression model revealed also revealed that only real exchange rate was significant.

The study further established that there is a bi- directional granger causality between inflation and real exchange rate, inflation and nominal exchange rate and generally inflation and exchange rate. Hence exchange rate depends on inflation and inflation depends on exchange rate.

The study recommended that; the government should formulate favorable policies like regulating capital inflows and encouraging exports as this can reduce instability in real exchange rate since it causes inflation which has a negative implication on the economic growth of the country, the government should formulate favorable policies like promoting currency evaluation that can control instability in Nominal exchange rate since it greatly causes inflation. The government should also formulate policies that can control inflation like adjustment in taxation as it also causes exchange rate and currency evaluation should also be promoted by boosting exports to regulate exchange rate.

CHAPTER ONE

BACKGROUND OF THE STUDY

1.0 Introduction.

This chapter covered the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, scope of the study (Conceptual scope and Geographical scope) and the significance/ justification of the study.

1.1 Historical Background

Globally, achieving sustainable inflation free economy is the objective of the most countries. It has been a problem to achieve such objective due to many factors that affects inflation. Measuring the rate of inflation is central subject of macroeconomics policy. Among many variables that can be stated as the determinant of inflation are exchange rates (Barro, 2016). The deference between the rising rate of inflation in the developed countries and the LDCS has been brought about the decline in the performance of the more developed countries that is china, India and some Latin American countries that were responsible for this superlative performance. It is believed that the rising and the fall in the prices of a dollar especially against the currencies used in Africa has been the greatest cause of Inflation (Rodin, 2016).

In Africa, due to illiteracy most people do not know the effect of exchange rate and how it causes inflation. The inflation rate of the countries has been increasing at unprecedented rates resulting into large reduction in extreme poverty as prices for goods continue to increase yet people do not have enough disposable income. The rate of growth in African countries is less than 5% but in most countries this is brought about by inflation especially resulting from exchange rate (Dan, 2015). The Sub Saharan African countries have experienced rapid increase in inflation which followed two decades of stagnation characterized in many of them by military conflicts, economic mismanagement and unsustainable external debt as a result of lagging behind In terms of exchange rate (Nicloz, 2018).

The East African Community (EAC) countries' are faced with a problem of inflation due to the fact that they rely mostly on imports than exports as this has continued to increase the inflation figures over and over (IMF working paper by Nicloz ,2018).

Generally, the economic conditions in East Africa have future prospects of increasing but less that 5% per annum due to the to the fact that exchange rate is still affecting these

countries thereby giving evidence for the unpredictable inflation figures (lavines, 2016).

In Uganda, the recent spike in inflation comes after a long period of low and stable single digit inflation that has been entrenched in Uganda since the 1990s. The long term commitment of the BOU remains to maintain price stability at all times. In this regard, it is important to understand the reasons for the recent surge in inflation, and also explain the stance that Bank of Uganda has adopted to deal with the problem.

Two developments need to be explained. First, at the international level, data from the World Economic Outlook indicates headline inflation in advanced economies to have risen to 3.5 percent in May 2008. The rise in inflation in advanced economies has led central banks to express growing concerns in regard to the current price environment. The increase in inflation is more marked and broader in developing economies, particularly Sub Saharan Africa where headline inflation has registered an average of 20.0 percent; the highest rates since the beginning of the current decade. In these economies, food and fuel make up a larger share of consumption baskets and sustained strong growth has tightened capacity constraints. The major part of the spike in inflation reflects sharp increases in global energy and food commodity prices, and other commodities. In part, the rise in prices was driven by the commodity boom that resulted from both accelerated demand and constrained supply. In particular, the increased demand from emerging economies for various commodities; demand for specific food crops and bio fuels; and slow supply responses, amplified the price pressures.

Second, on the domestic front, core inflation had remained in single digits since 1996 but rose above the 10 percent mark after April 2008. In the same vein, headline inflation was recorded at single digit levels for most of the period from August 1993 to May 2008. It was only some episodes in 1997, 2003 and 2005 that inflation rose above the 10 percent level, mainly due to the world oil prices increasing after the genesis of the gulf war, supply constraints after the closure of the sugar factories among others, and periods of elongated drought (world bank report ,2008).

The domestic food crop prices, as reported by the Uganda Bureau of Statistics, rose mainly due to seasonal factors, poor harvest, substitution effect and high domestic and regional demand. The rise I prices of processed foods were brought about by increased costs of raw materials, the impact of supply constraints as a result of the Kenyan crisis, together with

increased transportation costs due to the surge in the world oil prices, among others (UBOS report, 2009).

In the 1970s, Uganda experienced hyperinflation. Inflation was recorded at 216% per annum in 1979 .As part of the ERP and PEAP initiatives, inflation started to decline, indicated by the Consumer Price Index (CPI).With donor support, CPI started to decline. For example, it went from 154% to 101.10% per annum in 1996. Though CPI started to rise to the current 216% per annum, headline inflation reduced from 157.66% per annum in 1985 to 4.3% per annum in 2014. Despite advances in macroeconomic stability, CPI again increased to 216% per annum in 2014 (Bigsten & Kayizzi-Mugerwa, 1999).

Inflation in Uganda can be attributed to increasing money supply, world energy and food prices. Since inflation leads to price increases, rural poor communities (comprising 80% of the total population in Uganda) are most affected. This is because, first, the share of consumption in total income is larger for consumer goods such as food, soap, salt and cloth. Second, the income for agricultural products and salary earners does not increase in a similar proportion to manufactured products. Thus, increases in price reduce the range of goods available and real incomes to the poor. In turn, savings, future investment and welfare reduce.

Considering the effects of inflation became the avenues through which macroeconomic stability could be achieved in Uganda. Targeting inflation and achieving high GDP are two fundamental macroeconomic objectives of most economies (Mwanga & Sanday 2013; Kasidi & Mwakanemela, 2013). In Uganda, the government uses interest rates to control inflation, often increasing them. However, this means that the cost of borrowing increases while investments reduce. Since inflation affects consumption, production slows due to low purchasing power, and in-turn employment reduces.

Uganda experienced a high inflation in FY 2011/12 which averaged 23.5 percentage changes compared to 6.5 percent change registered in FY 2010/11. Inflation reduced to 4.9% in 20 13 and to 31.1 in 2014. From 2015 up to date, inflation figures have been increasing but less than 6% due to certain factors like presidential campaigns and electoral process (Kakinada, 2018).

Due to exchange rate as the shilling is still depreciating over a dollar, Uganda is still being faced with the problem of inflation. This is evidenced from the fact that the current exchange selling price of a dollar with a shilling is 3743.4 and the buying price is 3710. This means that

all imports are imported at higher prices and their prices must be increased thus a continuous increase in inflation.

1.1.2 Conceptual Background

The exchange rate refers to the nation's currency in-terms of another currency. An exchange rate thus has two components, the domestic currency and foreign currency, and can be quoted either directly or indirectly.

The exchange rates are categorized into two that is; the real exchange rate and nominal exchange rate. The Nominal exchange rate (NER) is a monetary concept, which measures the relative price of the two moneys or currencies for example Ugandan shilling in relation to U.S dollar.

By contrast, the real exchange rate (RER) is defined as the ratio of the price level abroad and the domestic price level, where the foreign price level is converted into domestic currency units via the current nominal exchange rate. Formally, $RER= (E.P^*)/P$, where the foreign price level is denoted as P^* and the domestic price level as P. A decrease in *RER* is termed appreciation of the real exchange rate, an increase is termed depreciation. In other wards it tells how much the goods and services in the domestic country can be exchanged for the goods and services in a foreign country (Czech National bank).

Inflation refers to an economic situation, which is characterized by a persistent fall in the value of the country's currency and rise in her exchange rate in the rest of the world. Inflation can be viewed as a general increase in the price of goods and services or a decline in the value of the currency used to purchase those goods and services (World Bank, 2015).

1.2 Problem Statement

With respect to inflation, Uganda experienced a high inflation in FY 2011/12 which averaged 23.5 percentage changes compared to 6.5 percent change registered in FY 2010/11. Inflation reduced to 4.9% in 2013 and to 31.1 in 2014. From 2015 up to date, inflation figures have been increasing but less than 6% due to factors like un stability in the exchange rate as a shilling depreciates against a dollar every time (Ministry of finance report ,2016).

Currently one Uganda shilling is worth 3743.7000 USD and it's not stable as every minute it is always changing in favour of the USD and not only a dollar but also other currencies. Empirical evidence shows that in East Africa a Uganda shilling is the one that has over lost value compared to other countries' currencies .This has continued to increase inflation in the country (World Bank, 2018).

In Uganda apart from exchange rate insatiability inflation is also caused by poor taxation policies, high costs of production, increase in government spending, importing inflated goods and many more and also exchange rate is caused by Balance of Payment problem, Political developments, Speculation, Market sentiments and Relative inflation (Bank of Uganda, 2017).

Foreign exchange instability negatively affects the economic growth and development of the country since it stimulates inflation and unemployment in the country. Inflation generally affects the economic stance of the country as it hinders foreign direct investment and exportation of commodities to other countries becomes so hard since the importing countries fear imported inflation.

However, very little has been done on the foreign exchange rates instability in Uganda and its effects on inflation. This shows that there is little attention on this subject, which is a huge gap that needs to be bridged.

Hence this study, sought to fill this gap by conducting a research on the effect of exchange rate on inflation rates in Uganda for the financial years 1990 to 2018.

1.3 Objective of the Study

1.3.1 Main Objective

To analyze the influence of the exchange rate on Uganda's inflation from 1990 to 2018.

1.3.2 Specific Objectives

i) To find out the relationship between nominal exchange rate and inflation rate in Uganda.
ii) To find out the relationship between real exchange rate and inflation rate in Uganda.
iii) To find out the causation between exchange rate and inflation in Uganda.

1.4 Research Hypothesis

H_O: there no significant relationship between nominal exchange rate and inflation rate.

Ha : there a significant relationship between nominal exchange rate and inflation rate

Ho: there no significant relationship between real exchange rate and inflation rate

Ha: there is a significant relationship between real exchange rate and inflation rate

Ho: is there is no causation between the exchange rate and inflation in Uganda

Ha: there is causation between exchange rate and inflation in Uganda

1.5 Significance of the Study

The study findings could help the Bank of Uganda in making future policies on the regulation of the foreign exchange markets, as one of the goals of the Central Bank through its Monetary Policy is to ensure foreign exchange stability.

The findings of the study will enable ministry of finance planning and economic development to come up with the right policies to regulate inflation in the country.

The findings of the study will enable the government to know the general effect of exchange rate on inflation and suggest possible recommendations towards the problem.

The study findings could also increase on the body of knowledge in the area of foreign exchange volatility, and its impact on the macro economy. Other researchers will also benefit from this study as it will open up new areas for research.

1.6 Scope of the Study

1.6.1 Theoretical Scope

The study employed the traditional flow model by druly (1964) which posits that exchange rate can affect the ability to import adversely and hence, the manufacturing sector output thereby causing inflation. The study further elaborated the monetary theory and its linkage on exchange rate and inflation.

1.6.2 Content Scope

The study focused on inflation and exchange rates in Uganda from fiscal year 1990 to 2018.The independent variable of the study was exchange rate and the dependent variable was inflation. Exchange rate was measured in terms of Nominal exchange rate and real exchange rate and inflation was measured in terms of Consumer price index. The study determined the relationship between real exchange rate and inflation and nominal exchange rate and inflation and causality between real exchange rate and inflation.

1.6.3 Geographical scope

The study was carried out in Uganda considering data from 1990 to 2018 as there is doubt among the populace that inflation is high evidenced from reduction in money supply

contrally to the reports that say that the inflation rate is not high in Uganda.

1.6.3 Time scope

The study used data and literature about the variables of the study from 1990 to 2018.

1.7 Operational Definition of key terms.

Inflation

Inflation is the persistent increase in the general price level of goods and services, measured in percentages annually.

Nominal exchange rate

Nominal exchange is defined as the number of units of the Uganda shillings that can purchase one United States Dollar.

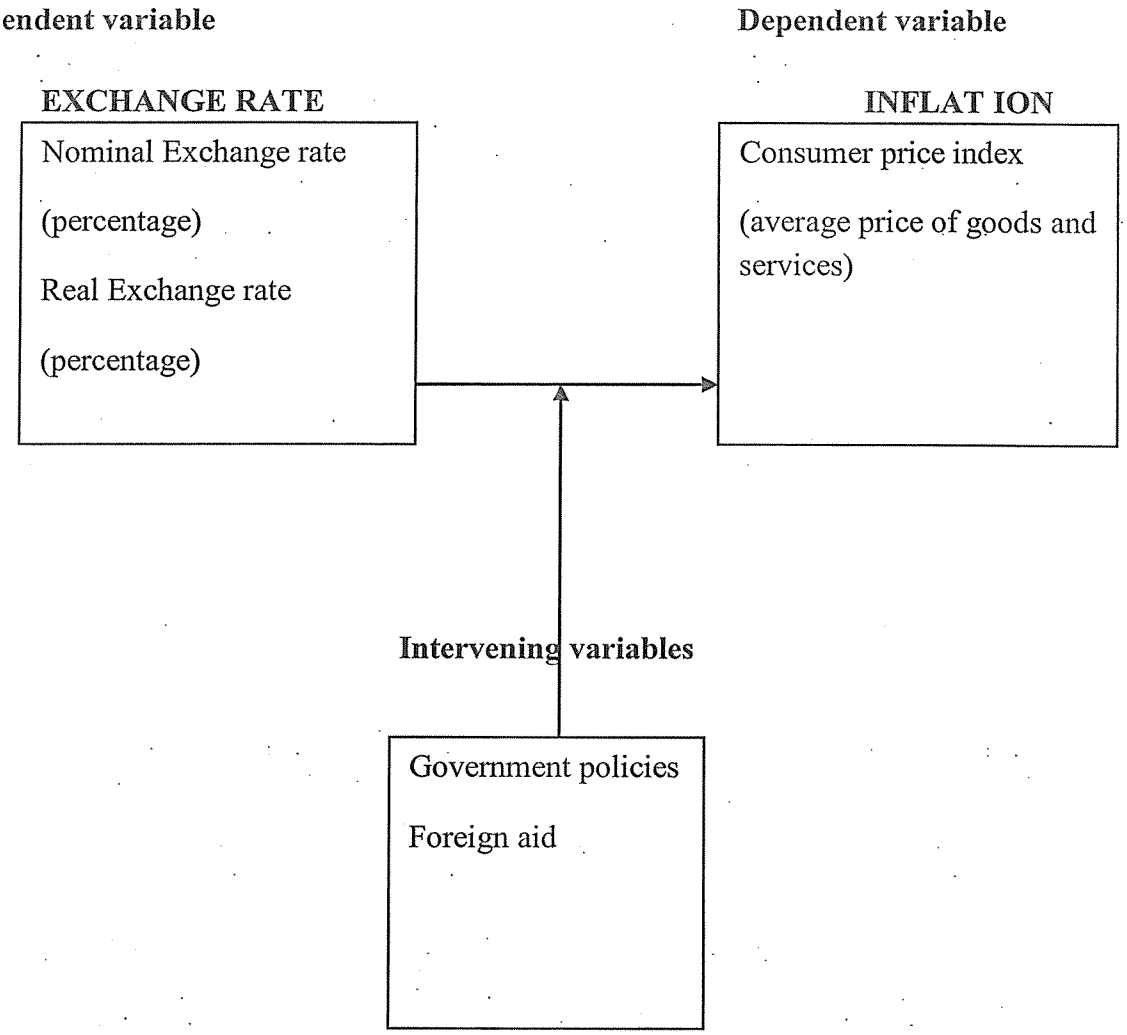
Real Exchange rate

Real exchange rate refers to the ratio of price level in Dollars to Domestic price level in shillings.

Exchange rate

An exchange rate refers to the ratio at which the unit of currency of one country may be, or is, exchanged for the unit of currency of another country. It is the price of one country's currency expressed in terms of another country's currency.

1.8 Conceptual framework



Adopted from: Eme (2011).

The figure above shows how the independent variable and the dependent variable were measured in this study. The dependent variable was measured in terms of Consumer price index and relative price index and the independent variable was measured in terms of real exchange rate and nominal exchange rate. The intervening variable was measured in terms of government policy and foreign aid as all these affect both variables of the study.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter focuses on reviewing the literature related to time series analysis of the nominal exchange rate on inflation from various scholars irrespective of the case studies. The review has been discussed in line with the stated research objectives.

2.1 Theoretical review

Traditional flow model and monetary theory are adopted as the theoretical framework for this study.

2.1.1 Traditional flow model

The traditional flow model is basically anchored on the principle of the interaction between demand and supply. According to the model, market forces of demand and supply interact to determine the rate of exchange in the foreign exchange market. Thus, when there is expectation or speculation of changes in the rate of exchange, it leads to disequilibrium even when there is no any change in the initial determined factors. The model emphasized that exchange rate can affect the ability to import and export adversely and hence thus leading to inflation. Exchange rate causes purchasing power instability as well as negative effect on the investment relative to import of inputs of an economy. However, the influence of exchange rate on the output of manufacturing sector and total income level also affects investment in the import of inputs and the exchange rate as well thereby causing inflation. This can happen because; among the determinant factors of exchange rate include the supply of foreign exchange effect by the level of productivity, and demand for foreign exchange in an economy (Drury, 1942).

2.1.2 Monetary theory

On the other hand, the monetary theory to exchange rate determination opines that the relative supply of money to meet its demand between two nations is the major factor that determines the rate of exchange. The theory postulated that changes in money supply lead to exchange rate, which in turn results into inflation. The theory further, expressed that a falling prices with a given nominal money supply cause depreciation in exchange rate (Ilechukwu & Nwokoye, 2015). Eme (2011) viewed exchange rate fluctuation as the inability of country to

sustain the fixed exchange system that attempt to fix the values of exchange currencies thereby bridging a gap for inflation. The author stated that the important feature of fixed exchange rate between two nations is that it tries to stabilize the rate of exchange while floating exchange rate deals with a system in which the forces of demand and supply freely determines the rate of currency exchange between the two countries. The floating exchange rate policy allows changes in currency price to help correct deficit balance of payments in the nation's balance of payments. The value of currency increase of a country and the higher currency prices leads to falls in import and rise in export which invariably affects the manufacturing sector' productivity level by increasing the prices thus inflation. In Nigeria, Asher (2015), expressed that the policy trusts are designed to correct exchange rate in the country; hence, exchange rate surfaces in a free floating exchange rate environment. This deals with a situation in which rates of currencies are determined through market mechanism (forces of demand and supply) in the absence of government interventions.

2.2 Empirical review

2.2.1 Relationship between real exchange rate and inflation rate

Katusiime, et al, (2016) studied real exchange rate volatility inflation nexus in Uganda; they developed an autoregressive distributed lag model to investigate the effect of real exchange rate volatility on inflation in Uganda. Using data spanning the period 1960–2011, they found that real exchange rate volatility negatively affects inflation in Uganda in both the short run and the long run. However, in the short run the relationship it was discovered that real exchange rate affects inflation to a small extent.

Alagidede and Ibrahim (2016) in the research on the causes and effects of real exchange rate volatility on inflation: Evidence from Ghana. Wanted to answer the questions of; what drives exchange rate volatility, and what are the effects of excessive fluctuations in the real exchange rate on inflation in Ghana? The study restricted its empirical flaws measure to the autoregressive conditional heteroscedasticity (ARCH) or generalized ARCH (GARCH). Their results showed that while shocks to the exchange rate are mean reverting, misalignments tend to correct very sluggishly, with painful consequences in the short run as economic agents recalibrate their consumption and investment choices thereby increasing the prices for commodities.

Semuel, and Nurina, (2015) in their study Analysis of the Effect of Interest Rates, and Real Exchange Rates on inflation in Indonesia; employed annual secondary data and then used the Partial Least Square (PLS) to test the hypothesis. It then applied the model path analysis developed by Sewall Wright (1934) with the aim to explain the direct and indirect result of several independent variables on the dependent variable. And finally using interest rates, and exchange rates as a supporting variable of inflation; the study found that there is a significant negative relationship of interest rates on inflation and a significant positive relationship of the exchange rates on the inflation.

According Jouko Rautava (2014), investigated the impact of international oil prices and the real exchange rate on the Russian economy and its fiscal policy. The data was analyzed using vector autoregressive (VAR) modeling and co integration techniques. The results indicated that the Russian economy is influenced significantly by fluctuations in oil prices and the real exchange rate through both long-run equilibrium conditions and short-run direct impacts. The inferred that severe changes in real exchange rate increase oil prices thus stimulating inflation.

Lubinga and Kiiza (2013) studied real Exchange Rate Uncertainty and inflation Insights from Uganda. They examined the impact of the real exchange rate volatility on the level and volatility of Uganda's inflation. They found out that real exchange rate increases inflation figures in the long run.

Mboya Oude (2013) examined the effect of exchange rate fluctuations on inflation in Kenya using time series data from 2008 to 2012 The model of this study inflation as a function of real exchange rate, GDP, exports, imports and government expenditure. Regression was conducted to test the impact. Findings indicated that, real exchange rate fluctuations has significant adverse effects on GDP, contracting the growth of real output and the demand for investment and exports, while raising inflation. The study recommended that monetary policies should be put in place to ensure inflation persistence is minimized and to ensure stability of real exchange rates in Kenya.

Khan & Ali (2011) were of the view that there were many determinants of the prices. They explained that the prices of real estate in Quetta city, Pakistan were based upon urbanization, refugees' influx, monetary, lack of investment alternatives and inflow of foreign remittances.

Tarawalie et al. (2012)in their study Exchange Rate, Inflation and Macroeconomic Performance in the West African Monetary Zone; investigated the effects of real exchange rate volatility on output growth and inflation in the West African Monetary Zone (consisting of Ghana, The Gambia, Guinea, Liberia, Nigeria and Sierra Leone) following exchange rate regime shift. Results from their study reveal that while exchange rate volatility is inflationary across all the countries, its effect on output growth differ. Specifically, volatility and depreciation in particular negatively affects real GDP growth in Liberia and Sierra Leone but positively impacts on output in the other countries albeit weakly. The difference in direction and magnitude of effect is not far-fetched from the differences in macroeconomic conditions prevailing in each country.

The Real Effective Exchange Rate (REER) is the weighted average of a country's currency relative to an index or basket of other main currencies adjusted to analyze the consequences of inflation. The relative trade balances were given due importance in determining the weights for comparing the currency of one country with each other country within the index. An individual country's currency value relative to the other major currencies in the index was determined by using this exchange rate, as adjusted for the effects of inflation (Investopedia, 2007).

Bonato (2007) looked at the determinants of inflation in Iran in both short run and long run. The approach focused on the relationship between nominal variables and inflation instead of using the traditional estimates of the demand function for real money balances. A long-term relationship was observed between the price level and as money, its rate of return, exchange rate and real output.

The REER was an indicator of trade competitiveness and captured the behavior of Pak-rupee against a basket of currencies (GOP, 2006). Nominal exchange rate, tariffs, trade subsidies, domestic and world market prices were included in real effective exchange rate. The change in country's competitive position relative to its trading partners was reflected by REER.

Philip et. al (2006) in their study "Real Exchange Rate and inflation. The Role of Financial Development" using GMM panel data of time series (1960-2000) of 83 countries found that real exchange rate volatility has a significant impact on the long-term rate of inflation, but the effect depends critically on a country's level of financial development.

The research conducted by (Catalina.A and Susan.P, 2004) on the Workers' Remittances and the Real Exchange Rate using a panel of 13 Latin American and Caribbean countries reveals that workers' remittances have the potential to inflict economic costs on the export sector of receiving countries by reducing its international competitiveness. This study also concerns parallel to those raised by Dutch Disease or Resource Boom models, where resource discoveries result in real exchange rate appreciation and shifting of resources from the traded to the non-traded sectors of the economy thereby increasing prices for the commodities.

Kihangire (2004) studied the effects of real exchange rate variability on exports: evidence from Uganda and using monthly data, the study investigates the effects of exchange rate variability on Uganda's aggregate export growth under the floating exchange rate policy regime (2001), benchmarked on the fixed exchange rate regime (1988-1993; the study applied the ARDL approach to co-integration and OLS. The results show that Uganda's exports are negatively and significantly correlated with exchange rate variability." Due to lack of pure I (0) or I (1) for all the series, and absence of endogeinity and simultaneous bias problems between export supply and export demand thereby increasing inflation rate.

2.2.2 Relationship between Nominal exchange rate and inflation rate

In Uganda, the current Inflation rates for the year ending July 2017 is 5.7 percent compared to the 6.4% recorded during the year ended June 2017.This represents a 0.7 percentage point drop from the previous month Uganda Bureau of Statistics(UBOS, 2017).

Positive relationship between inflation and exchange rates can also be explained by Purchasing Power Parity (PPP) theory which explains that the nominal exchange rates are established in a country depending on the ratio of the prices of goods and services in that particular country (BoU, 2016).

The Common Market for Eastern and Southern Africa (COMESA) regional block remained the main destination for Uganda's exports throughout the last five years under review. The combined exports earnings from COMESA increased from US$ 1,151 million (43%) in 2014 to US$ 1,263 million (47.5%) in 2015, UBOS (2016). Among the countries that recorded significant export earnings within the COMESA region were Kenya, D.R.Congo and Rwanda, accounting for US$ 523.4 million, US$ 333.9 million and US$ 259.3 million respectively in 2015. In the EU bloc, Italy (3.7 percent), Germany Federal Republic (2.9

percent), Netherlands (2.9 percent) and Belgium (2.6 percent) were the main destination for Uganda's exports in 2015,(UBOS statistical abstract,2016)

During the period under review, the Asian continent remained the major source of Uganda's imports with total expenditure value of US$ 3,377 million in 2014 and US$ 2,976 million in 2015. However, its market shares to the total imports dropped from 55.0 % in 2014 to 53.8 in 2015. This drop is as a result of the reduced imports from India whose expenditure share decreased from 24.3 percent in 2014 to 20.9 % in 2015 (UBOS,2016) all these significant changes greatly contribute to inflation as imports are exchanged in terms of dollars yet the currency for African countries usually depreciates over a dollar.

The main trading partners in this region were the United Arab Emirates (UAE) and Saudi Arabia accounting for 7.3 percent and 4.0 percent respectively. Overall, the trade deficit continued to widen as a result of importation of high value manufactured goods compared to low valued exports of primary agricultural products thereby causing inflation (UBOS,2016).

Nominal Exchange rate fluctuations have an indirect supply effect on domestic prices. The potentially higher cost of imported inputs associated with an exchange rate depreciation increases marginal cost and leads to higher prices of domestically produced goods (Mishkin, 2008).

According to Obstfeld and Rogoff (1995) , nominal exchange rate depreciations (appreciations) increase (decrease) foreign demand for domestic goods and services, causing increase (decrease) in net exports and hence aggregate demand. They inferred that there is a linear relationship between nominal exchange rate, real exchange rate and inflation.

2.2.3 Causation between real exchange rate and inflation rate

Inflation may be one of the factors affecting exchange rate while it may also be the factor affected by the exchange rate. In literature, both views are tested and examined. One of the popular subjects is the pass-through effect of exchange rates on domestic prices.

For Turkey case, Central Bank experts Arslaner et al. (2014) worked on 1986-2013 data to see the exchange rate pass-through effects on inflation. The results showed that like other developing countries there is an exchange rate pass-through affecting inflation. The pass-through degree is higher in Turkey compared to developed countries. Another interesting finding is that the pass-through is higher for producer price index than consumer price index (CPI).

Özkan (2013) analysed PPP for Turkish Lira – Euro and Turkish Lira – US Dollar cases. The study showed that for the Dollar – Turkish Lira case the Dollar's purchasing power has an effect on the parity while for the Euro – Turkish Lira case the Turkish Lira's purchasing power has a greater effect.In literature, while results change among papers the difference in results might be due to the countries compared and the data sets used. Also as it can be seen many studies focused on US Dollar, Euro or German Mark. Therefore, basing from this literature it is evident that inflation can cause exchange rate and also exchange rate can cause inflation.

The main factors for the pass-through are found to be past currency crises and the openness of the economy. Özçiçek (2007) studied on pass-through coefficients and found out that the crises have a significant effect on the pass-through coefficient. Özçiçek showed that for Turkey case the pass-through coefficient is low when the economic crises' data are excluded and the coefficient increases when the economic crises' data are included. He inferred that it is real exchange rate that causes inflation and also he concluded that to some extent, inflation causes real exchange rate.

Gül and Ekinci (2006) reached a different conclusion when they used monthly data between January 1994 and December 2003. Their findings showed that there is a longrun relationship between nominal exchange rates and inflation, and a causal relationship between nominal exchange rates to inflation.

Edwards (2006) analysed the pass-through subject from an "inflation targeting" perspective. Edwards studied the relationship between the pass-through and the effectiveness of nominal exchange rates in regimes, which have inflation targeting. The results showed that countries with inflation targeting experienced decreasing pass-through effects of exchange rate changes to inflation.

Alba and Park (2005) analysed if PPP exists between Turkish Lira and German Mark. For Turkish Lira and German Mark situation the findings showed that PPP exists especially for years closer to date the analyse was done.

Albuquerque and Portugal (2005) studied the relationship between exchange rate and inflation volatilities. They used a bivariate GARCH model for test and found a relation between exchange rate and inflation variances.

Bayraktar and Arslan (2003) worked on a 20-year data between 1990 and 2010 for Turkey to study the relationship between exchange rate, inflation and import. They found that the variables are cointegrated and there is a long-term relationship between these variables. Also, they used Granger causality test but the results showed there is a Granger causality from inflation to exchange rate or vice versa.

Berument (2002) examined the effects of foreign exchange rates on inflation. He found that the foreign exchange rate effects inflation. In addition, he tested the effects of CPI and producer price index separately. The results showed that the producer price index is affected by foreign exchange rate more than CPI.

Choudri and Hakura (2001) worked on a large data set of 71 countries for the years 1979-2000. They found a pass-through, which is from exchange rate to prices. The pass-through gets higher for the countries with higher inflation meaning "higher inflation higher pass through." Their findings are consistent with Taylor's (2000) paper, which inspired them. Their findings revealed that nominal exchange rate greatly causes inflation and in most countries it as a result of inflation that nominal exchange instability is increasing especially in developing countries.

Telatar and Kazdagi (1998) analysed long-run PPP for Turkish Lira and currencies of the major trade partners of Turkey. They used data for the years 1990-1993. Their findings did not show a relationship between exchange rates and prices.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction.

This section presents the procedures that were followed in execution of data so as to arrive at statistically meaningful results. The section contained the research design, study population, sample size, data type and source, data processing and analysis, model specifications and estimation and ethical consideration.

3.1 Research Design.

The study employed a descriptive research design. Amin (2005) argues that this design helps to determine relationships about different variables of the study.The design involved determining the relationships between the variables of the study by using regression analysis. And also granger causality test was employed to determine the causal relationship between the variables of the study. Time series data of inflation, real exchange rate and nominal exchange rate from 1990-2018 were used in this study.

3.2 Data Type and Source

The study used Time series data and the data was collected from Uganda Bureau of Statistics (UBOS) abstracts.

3.3 Data processing and Analysis

The researcher used STATA analysis package for data analysis as it was the most preferable while dealing with time series data and also SPSS Package was used. Data was entered into spss package and later it was exported to STATA for further analysis. She further carried out a normality test using Shapiro wilkson test for Normality, this aimed at seeing whether the variables were normally distributed.

Because time series data was used, to avoid having spurious results there is always need to first test for stationarity therefore the researcher tested for unit root using Phillips Peron and Augmented Dickey-Fuller test (ADF). Phillips Peron was used because exchange rate was expected to be trended.

Regression analysis was performed to determine the individual relationship between the variables of the study.

3.4 Model specification.

3.4.1 Bivariate analysis

Correlation analysis was done at this level of analysis. Correlation was used because the variables are non-categorical. Inflation was analyzed with exchange rate in this study. This was tested for the existence of significant relationship between inflation and respective variables and bivariate regression analysis was carried to test the individual effect of the independent variables on the dependent variable and also a multiple regression model was used to also give further evidence about the relationship.

3.5 Model Specification

The regression model was as follows:

$y = f(x)$..... (1)

Where;

y is the dependent variable and is represented as Inflation

x is the independent variable

More specifically, equation (1) was written as;

$y = f(x_1)$ ..... (2)

Where;

y = Inflation

x_1 = Nominal Rate

$y = b_0 + bx_1$.

and

$y = f(x_2)$ ..... (2)

Where;

x_2 = real exchange rate

$Y = b_0 + bx_2$ ..... (3)

Where;

b_0 is the regression constant

b_1, and b_2 are the parameter coefficients and et is the error term.

A multiple regression analysis model was used to give further explanation about the relationship between the variables.

Where;

$Y=bo+b_1x_1+b_2x_2$

X_1 = real exchange rate

X_2=nominal exchange rate

b_0 is the regression constant

b_1, and b2 are the parameter coefficients and et is the error term.

3.6 Ethical Consideration

The researcher obtained data from the website of UBOS and World Bank and carried out analysis on the variables. The data obtained was not manipulated to fit the interests of the researcher. The findings of the study is strictly for academic and policy design purposes without any bias

3.7 Limitations

3.7.1 Study limitations

Limited control over data quality (Saunders, 2009). Government and other official institutions are often a guarantee of quality data, but it is not always the case.

3.7.2 Limitations of linear regression

Linear regression analysis assumes a linear model yet some models are not linear for example the curve linear models.

Presence of outliers limits effective use of regression analysis.

The study findings are limited restricted to the following linear regression assumptions;

- there is a linear relationship.

-there is a multivariate normality.

-there is little or no multicollinearity.

-there is no auto- correlation.

-there is homoscedasticity.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.0 Introduction

This Chapter presents data analysis and interpretation was made in accordance with the research objectives of the study.

4.1 Testing Time series Data

4.1.1 Normality test

Table 1: Normality test for real exchange rate, inflation and nominal exchange rate

Variable	Method	Tests statistic	Pro>z
Real exchange rate	Shapiro wilkson test (w)	0.80831	0.00012
Inflation	Shapiro wilkson test (w)	0.78748	0.00005
Nominal exchange rate	Shapiro wilkson test (w)	0.94339	0.12229

Source: STATA output (2019).

From Table one above, since w = 0.80831 is almost approaching to one, there is evidence that data about real exchange rate is normally distributed thus it can give correct results, since w = 0.78748 is almost approaching to one, there is evidence that data about inflation is normally distributed and also since w = 0.94339 is almost approaching to one, there is evidence that data about real exchange rate is also normally distributed. Therefore data about all the variables of the study was normally distributed thus giving evidence for reliable results and inferences for the study.

4.1.2 Unit root test for the variables

Table 2: Unit root test for real exchange rate, inflation and nominal exchange rate

Variable	Method	Tests statistic	Critical value	Prob>Z
Real exchange rate	Augmented Dickey fuller test	-3.564	-2.99	0.0065
Inflation	Philips Peron Test	**-3.923**	**-2.992**	**0.0019**
Nominal exchange rate	Augmented Dickey fuller test	**-4.292**	**-2.992**	**0.0005**

Source: STATA output (2019).

From Table 2 above, For Dickey fuller test, the criteria is that we reject Ho that the time series data is not stationary if the test statistic is greater than the critical value. Since the test statistic is equal to -3.564 less than -2.626 we accept the alternative that time series data about real exchange rate is stationary and it can give clear results and also for real exchange rate, Since the test statistic=-4.292 is less than -2.992 we accept the alternative that time series data about real exchange rate is stationary and it can give clear results, For Philips Peron test ,the criteria is that we reject Ho that the time series data is not stationary if the test statistic is greater than the critical value. Since the test statistic=-3.923 is less than -2.992 we accept the alternative that time series data about inflation is stationary and it can give clear results.

4.2 Relationship between inflation and real exchange rate

Table 3: Model summary for inflation and real exchange rate

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.986[a]	.972	.971	2.14742

a. Predictors: (Constant), Real exchange rate

Source: STATA output (2019).

From Table 4, for R=0.986, it implies that there is a strong linear relationship between inflation and exchange rate. Therefore if exchange rate increases, inflation also increases. For

R- square =0.92 it implies that variations in the exchange rate explain variations in Inflation by 97.2%

Table 4: Regression analysis for inflation and real exchange rate

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.321	.539		-.595	.557
	Real exchange rate	.632	.020	.986	31.102	.000

a. Dependent Variable: Inflation

Source: STATA output (2019).

From Table 4, the regression model is Inflation= -0.321+0.632 Real exchange rate

Interpretation

-0.321 implies that without the effect of real exchange rate, inflation rate is -0.321 and for 0.632 it means that a unit increase in real exchange rate increases inflation by 63.2%.

4.3. Relationship Between Nominal Exchange Rate and Inflation

Table 5: Model Summary for Nominal exchange rate and inflation

Mode 1	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.940[a]	.884	.880	4.35155

a. Predictors: (Constant), Nominal exchange rate

Source: STATA output (2019).

From Table 5, it is evident that there is a strong positive relationship between Nominal exchange rate and inflation since R= 0.940 is almost approaching to 1. For R square=0.884, it means that the variations in nominal exchange rate explain the variations in inflation by 88.4%.

Table 6: Regression Analysis for Nominal exchange rate and inflation.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-13.548	1.867		-7.257	.000
	Nominal exchange rate	.584	.040	.940	14.642	.000

a. Dependent Variable: Inflation

Source: STATA output (2019).

From Table 6, the regression model is Inflation= -13.548+0.5843 Real exchange rate

Interpretation

-13.548 implies that without the effect of nominal exchange rate, inflation rate is -13.548 and for 0.584 it means that a unit increase in real exchange rate increases inflation by 58.4%.

4.4: Overall model summary

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.988[a]	.976	.974	2.06970

a. Predictors: (Constant), Nominal exchange rate, Real exchange rate

Source: STATA output (2019).

From Table 7, it is evident that there is a strong positive relationship between Nominal exchange rate, real exchange rate and inflation in Uganda. This is because variations in nominal exchange rate and real exchange rate explain the variations in inflation by 97.6%

Table 8: Multiple regression model

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-2.744	1.408		-1.949	.062
Real exchange rate	.542	.055	.843	9.793	.000
Nominal exchange rate	.095	.053	.153	1.782	.086

a. Dependent Variable: inflation

Source: STATA output (2019).

From Table 8, the regression model is Inflation= -2.744+0.542 Real exchange rate+0.95 Nominal exchange rate.

Interpretation

Table 8 above indicates that there is a statistically positive relationship between real exchange rate and inflation. However, the nominal exchange rate does not have any significant effect on inflation at 95% level of significance.

4.5 Causation between inflation and exchange rate

Table 9: Granger causality test for causal relationship between exchange rate and inflation

Null Hypothesis	Observations	Statistic	P-value
Exchange rate does not cause inflation	28	0.15231	0.001
Inflation does not causes exchange rate	28	0.14639	0.04

Source: STATA output (2019).

From Table 9, the null hypothesis of exchange rate does not Granger Cause inflation is rejected since its corresponding p-value (0.001) is less than the level of significance (0.05). The null hypothesis of inflation does not Granger Cause exchange rate was rejected since

its corresponding p-value (0.04) is less than the level of significance (0.05). Hence there is a bi- directional granger causality between Exchange rate and inflation. Thus this means that inflation depends on exchange rate and exchange rate depends on inflation.

4.5.1 Causation between inflation and real exchange rate

Table 10: Granger causality test for causal relationship between real exchange rate and inflation

Null Hypothesis	Observations	Statistic	P-value
Real Exchange rate does not cause inflation	28	0.7630	0.023
Inflation does not causes real exchange rate	28	0.0568	0.042

Source: STATA output (2019).

From Table 10, the null hypothesis of real exchange rate does not Granger Cause inflation is rejected since its corresponding p-value (0.023) is less than the level of significance (0.05). The null hypothesis of inflation does not Granger Cause real exchange rate was rejected since its corresponding p-value (0.042) is less than the level of significance (0.05).Hence there is a bi- directional granger causality between real exchange rate and inflation. Thus this means that inflation depends on real exchange rate and real exchange rate depends on inflation.

4.5.2 Causation between nominal exchange rate and inflation

Table 11: Granger causality test for causal relationship between Nominal exchange rate and inflation

Null Hypothesis	Observations	Statistic	P-value
Nominal Exchange rate does not cause inflation	28	0.4672	0.0001
Inflation does not causes Nominal exchange rate	28	0.0782	0.036

Source: STATA output (2019).

From Table 11, the null hypothesis of Nominal exchange rate does not Granger Cause inflation is rejected since its corresponding p-value (0.0001) is less than the level of

significance (0.05). The null hypothesis of inflation does not Granger Cause nominal exchange rate was rejected since its corresponding p-value (0.036) is less than the level of significance (0.05) .Hence there is bi- directional granger causality between nominal exchange rate and inflation. This means that nominal exchange rate depends on inflation and inflation depends on nominal exchange rate.

CHAPTER FIVE

DISCUSSION OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter dealt with the discussion of the findings, conclusion and presents recommendations of the study. Conclusions were made on the relationship between real exchange rate and inflation, nominal exchange rate and inflation and the causation between exchange rate and inflation in Uganda.

5.1 Discussion of the findings

5.1.1 Relationship between inflation and real exchange rate

The findings of the study revealed that there is a strong linear relationship between inflation and exchange rate of 0.986.Therefore if real exchange rate increases, inflation also increases. For R- square =0.92 it implies that variations in the exchange rate explain variations in Inflation by 92%.

The regression model obtained was Inflation= -0.321+0.632 Real exchange rate. For -0.321,it implies that without the effect of real exchange rate, inflation rate is -0.321 and for 0.632 it means that a unit increase in real exchange rate increases inflation by 63.2%.

This is in line with Kakinda (2016) and Rubinga (2011) who inferred that a rise in real exchange rate increases inflation greatly.

5.1.2 Relationship between Nominal exchange rate and inflation

From the findings of the study it is evident that there is a strong positive correlation between Nominal exchange rate and inflation since the correlation coefficient 0.940 is almost approaching to 1.Furthermore, since the significant value (0.000) was less than 0.05, it implies that the model is significant thus it gives reliable results and inferences. The regression model was Inflation= -13.548+0.584 Nominal exchange rate. For -13.548 it implies that without the effect of nominal exchange rate, inflation rate is -13.548 and for 0.584 it means that a unit increase in nominal exchange rate increases inflation by 58.4% and vice versa.

This is highly related with Benson 2016 and UBOs report 2017 all of which inferred that a continuous rise in nominal exchange rate continues to be the main cause of increasing inflation figures in Uganda.

5.1.3 Relationship between Nominal exchange rate, real exchange rate and inflation.

From the findings of the study the regression model is Inflation = -2.744+0.542 Real exchange rate+0.95 Nominal exchange rate.-2.744 implies that without the effect of nominal exchange rate, inflation rate is -2.744 and for 0.542 it means that a unit increase in real exchange rate holding nominal exchange rate constant increases inflation by 58.4% and also 0.95 it means that a unit increase in nominal exchange rate holding real exchange rate constant increases inflation by 95%.Results further indicate that there is a statistically positive relationship between real exchange rate and inflation. However, the nominal exchange rate does not have any significant effect on inflation at 95% level of significance. This is in line with Obstfeld and Rogoff (1995) who inferred that that there is a linear relationship between nominal exchange rate, real exchange rate and inflation.

5.1.4 Causality between exchange rate and inflation.

This objective was measured using the null hypothesis of exchange rate does not Granger Cause inflation which was rejected since its corresponding p-value (0.001) was less than the level of significance (0.05). The null hypothesis of inflation does not Granger Cause exchange rate was rejected since its corresponding p-value (0.04) was less than the level of significance (0.05). Hence there is bi- directional granger causality between Exchange rate and inflation. Thus this means that inflation depends on exchange rate and exchange rate depends on inflation. This is in line with the results of the study by Özkan (2013) who inferred that exchange rate causes inflation and a rise inflation figures also causes exchange rate.The null hypothesis of real exchange rate does not Granger Cause inflation was rejected since its corresponding p-value (0.023) was less than the level of significance (0.05). The null hypothesis of inflation does not Granger Cause real exchange rate was rejected since its corresponding p-value (0.042) was less than the level of significance (0.05). Hence it was revealed that there is a bi-directional granger causality between real exchange rate and inflation. This implies that real exchange rate depends on iflation and inflation also depends on real exchange rate. This is in line with Özçiçek (2007) who inferred that it is real exchange rate that causes inflation and also he concluded that to some extent, inflation causes real exchange rate.

From the study, the null hypothesis of Nominal exchange rate does not Granger Cause inflation was rejected since its corresponding p-value (0.0001) is less than the level of significance (0.05). The null hypothesis of inflation does not Granger Cause nominal

exchange rate was rejected since its corresponding p-value (0.036) was less than the level of significance (0.05).Hence there it was evident that there is a bi-direction granger causality between nominal exchange rate and inflation. This implies that inflation depends on nominal exchange rate and nominal exchange rate depends on inflation. This is in line with the studies by Choudri and Hakura (2001) and taylor 2000 who inferred that nominal exchange rate greatly causes inflation and in most countries it is as a result of inflation that nominal exchange rate is increasing especially in developing countries.

5.2 Conclusion

5.2.1 Relationship between inflation and real exchange rate

The findings of the study revealed that there is a strong positive linear relationship between real exchange rate and inflation. It was found out that a unit increase in real exchange rate increases inflation by 63.2%.

5.2.1 Relationship between inflation and real exchange rate

The findings of the study revealed that there is a strong positive linear relationship between nominal exchange rate and inflation. It was found out that a unit increase in nominal exchange rate increases inflation by 58.4% and vice versa.

5.2.3 Causation between inflation and exchange rate

The findings of the study revealed that exchange rate causes inflation to a greater extent and it was also found out that inflation causes exchange rate to a small extent. The study further established that there is a causal relationship between inflation and real exchange rate and also it gave evidence that there is a causal relationship between nominal exchange rate and inflation.

5.3 Recommendations.

5.2.1 Relationship between inflation and real exchange rate

The government should formulate favorable policies like regulating capital inflows and encouraging exports as this can reduce instability in real exchange rate since it causes inflation which has a negative implication on the economic growth of the country.

5.2.1 Relationship between inflation and Nominal exchange rate

The government should formulate favorable policies like promoting currency evaluation that can control instability in Nominal exchange rate since it greatly causes inflation.

5.3.3 Causation between inflation and exchange rate

The government should also formulate policies that can control inflation like adjustment in taxation as it also causes exchange rate and currency devaluation.

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Appendices

Appendix 1: STATA out put showing normality test of real exchange rate

```
. swilk Real_exchange_rate

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W          V          z       Prob>z
-------------+--------------------------------------------------
Real_excha~e |    29    0.80831    5.941      3.677     0.00012
```

Appendix 1: STATA output showing normality test of inflation

```
. swilk Inflation

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W          V          z       Prob>z
-------------+--------------------------------------------------
   Inflation |    29    0.78748    6.587      3.890     0.00005
```

Appendix 2 :STATA output showing normality test of nominal exchange rate

```
. swilk Nominal_exchange_rate

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W          V          z       Prob>z
-------------+--------------------------------------------------
Nominal_ex~e |    29     0.94339      1.755      1.160    0.12299
```

Appendix 3: STATA output showing unit root test of real exchange rate

```
. dfuller Real_exchange_rate, lags(0)

Dickey-Fuller test for unit root                   Number of obs   =        28

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.564           -3.730            -2.992           -2.626
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0065
```

Appendix 4: STATA output showing unit root test of inflation rate

```
. pperron Inflation

Phillips-Perron test for unit root                 Number of obs   =        28
                                                   Newey-West lags =         3

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)          -14.144          -17.404           -12.596          -10.260
 Z(t)             -3.923           -3.730            -2.992           -2.626
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0019
```

Appendix6: STATA output showing unit root test of Nominal exchange rate

```
. dfuller Nominal_exchange_rate, lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        28
```

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-4.292	-3.730	-2.992	-2.626

MacKinnon approximate p-value for Z(t) = 0.0005

Appendix 7: Data about real exchange rate (perentage), nominal exchange rate(percentage), inflation (percentage) and exchange rate(percentage change).

Year	Real Exchange rate	Inflation	Nominal exchange rate	Exchange rate instability
1990	62.7	44.38	84.12	146.82
1991	44.1	26.02	62.1	106.2
1992	70.24	45.07	85.5	155.74
1993	50.9	30.14	75.1	126
1994	13.1	6.85	31.9	45
1995	18.12	9.38	45.22	63.34
1996	5.87	4.57	33.96	39.83
1997	1.06	3.1	25.12	26.18
1998	17.82	8.79	37.22	55.04
1999	0.05	-0.11	10.43	10.48
2000	20.56	11.12	53.11	73.67
2001	5.55	4.53	33.25	38.8
2002	0.11	-3.17	9.45	9.56
2003	10.55	7.81	41.35	51.9
2004	30.12	15.59	58.36	88.48
2005	0.27	-1.74	6.59	6.86
2006	4.12	2.41	26.22	30.34
2007	10.25	7.32	40.21	50.46
2008	9.33	6.36	30.12	39.45
2009	51.09	34.01	78.91	130
2010	19.22	10.58	50.23	69.45
2011	12.89	6.16	42.44	55.33
2012	41.36	21.71	58.12	99.48
2013	11.22	4.03	32.01	43.23
2014	4.12	3.44	28.8	32.92
2015	4.95	5.08	34.06	39.01
2016	6.71	5.51	38.08	44.79
2017	6.98	5.6	39.85	46.83
2018	7.22	5.7	40.89	48.11

Source: UBOS abstracts (1990-2018).