

**THE EFFECT OF EXCHANGE RATE VOLATILITY ON  
INFLATION RATES IN KENYA**

**BY:**

**BENEDICT DUNCAN MULWA**

**D61/63075/2011**

**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT  
OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF  
MASTER OF BUSINESS ADMINISTRATION, UNIVERSITY OF  
NAIROBI.**

**OCTOBER, 2013**

## DECLARATION

This research project is my own original work and has not been presented for examination in any other University

Signed:                      DATE: .....

**BENEDICT DUNCAN MULWA**

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

Signature: .....                      DATE .....

**MR. HERICK ONDIGO**

Lecturer,

Department of Finance and Accounting,

School of Business,

University of Nairobi

## **ACKNOWLEDGEMENT**

I would like to thank my supervisor Mr. Herrick Ondigo for his valuable and constructive suggestions during the planning and development of this research project. I also extend my appreciation for other members of staff for School of Business time for generously giving out their time and suggestions in the development of this research paper. My special thanks are also extended to my wife Lilian and Kids Nathan and Terry for their support and encouragement during the entire period of study.

## **DEDICATION**

I wish to dedicate this work to my lovely wife Lilian, adorable kids Nathan and Terry, and the entire family, without them this work would not have been possible.

# TABLE OF CONTENTS

<b>DECLARATION</b> .....	<b>ii</b>
<b>ACKNOWLEDGEMENT</b> .....	<b>iii</b>
<b>DEDICATION</b> .....	<b>iv</b>
<b>LIST OF TABLES</b> .....	<b>vii</b>
<b>LIST OF FIGURES</b> .....	<b>viii</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>ix</b>
<b>ABSTRACT</b> .....	<b>x</b>
<b>CHAPTER ONE: INTRODUCTION</b> .....	<b>1</b>
1.1 Background of the Study .....	1
1.1.1 Exchange Rates Volatility.....	2
1.1.2 Inflation Rates.....	4
1.1.3 Effect of Exchange Rate Volatility on Inflation Rates.....	5
1.2 Research Problem .....	6
1.3 Research Objective .....	8
1.4 Value of the Study .....	8
1.4.1 Central Bank of Kenya.....	8
1.4.2 Commercial Banks in Kenya .....	8
1.4.3 Scholars and Researchers.....	9
<b>CHAPTER TWO: LITERATURE REVIEW</b> .....	<b>10</b>
2.1 Introduction.....	10
2.2 Theoretical Review .....	10
2.2.1 Excess-Demand Theories of Inflation.....	10
2.2.2 Structuralists / Cost-Push Theory of Inflation .....	13
2.2.3 The Balance of Payments Theory .....	15
2.3 Determinants of Inflation .....	16
2.4 Determinants and Effects of Exchange Rates Volatility.....	18
2.4.1 Effect of Exchange Rate Volatility on Inflation Rates.....	19
2.4.2 Effect of Exchange Rate Volatility on Investment .....	22
2.4.3 Effect of Exchange Rate Volatility on Trade.....	23
2.5 Empirical Review.....	24

2.6 Summary of Literature Review .....	28
<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>	<b>29</b>
3.1 Introduction.....	29
3.2 Research design .....	29
3.3 Data Collection .....	30
3.4 Data Analysis .....	30
3.4.1 Analytical Model .....	31
<b>CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION .....</b>	<b>32</b>
4.1 Introduction.....	32
4.2 Diagnostic tests .....	32
4.3 Time Series .....	35
4.4 Auto Regressive Integrated Moving Average.....	36
4.5 Interpretation of Findings .....	38
<b>CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS .....</b>	<b>39</b>
5.1 Introduction.....	39
5.2 Summary .....	39
5.3 Conclusion .....	40
5.5 Recommendations for policy .....	41
5.6 Limitations of the Study.....	41
5.7 Recommendations for Further Study .....	41
<b>REFERENCES.....</b>	<b>43</b>
<b>APPENDICES .....</b>	<b>49</b>

## LIST OF TABLES

Table 4.1: Model Summary .....	32
Table 4.2: ANOVA.....	33
Table 4.3 Regression Coefficients .....	34
Table 4.4: Model Fit .....	36

## LIST OF FIGURES

Figure 4.1 Time Series .....	35
------------------------------	----



## **LIST OF ABBREVIATIONS**

<b>ANOVA-</b>	Analysis of Variance
<b>CBK-</b>	Central Bank of Kenya
<b>ERPT-</b>	Exchange Rate Pass-Through
<b>IDRC-</b>	International Development Research Centre
<b>KBA-</b>	Kenya Bankers Association
<b>RER-</b>	Real Exchange Rate
<b>US-</b>	United States
<b>USD-</b>	United States Dollar

## **ABSTRACT**

Exchange rate stability is one of the main factors that promote total investment, price stability and stable economic growth. The main objective of this study was to investigate the effect of exchange rate volatility on inflation rates in Kenya. Descriptive design deemed the best strategy to fulfill the objectives of this study. This study covered a period of less than 10 years i.e. (2003 - 2013). In this research, secondary data was collected from Central Bank of Kenya. Average US Dollar exchange rates and inflation rates for the years of study were used. The analysis used Auto Regressive Integrated Moving Average (ARIMA) models describe the current behavior of variables in terms of linear relationships with their past values. A regression model was applied to determine the relative relationship between exchange rate volatility and Inflation rate. The test indicated that there was moderate relationship between foreign exchange rates volatility and inflation rates. On carrying out an Analysis of Variance tests (ANOVA) and at 95% confidence level, it was found out that there was an insignificant relationship between exchange rates volatility and inflation rates. Using t-statistic table, the relationship can be seen to be strong, negative but not significant.. From this study it has been demonstrated that even though there is a relationship between exchange rates and inflation the relationship has a number of weaknesses. Exchange rates cannot be used to reliably predict movement in inflation rates. This is because the model used by the study showed there was an insignificant relationship between foreign exchange and inflation rates. To model a comprehensive study, future scholars should focus on using other alternate currencies such as the Euro to model this relationship.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

In most developing countries there is the dearth of capital for investment which has affected the economic situation of these nations. In order to ameliorate the situation various governments of these nations have now focused much attention on investment especially foreign exchange rates which will not only guarantee employment but will also impact positively on economic growth and development. Foreign exchange rates are needed to reduce the difference between the desired gross domestic investment and domestic savings. Engel (2005) asserts that foreign exchange rate is expected to contribute to economic growth not only by providing foreign capital but also by crowding in additional domestic investment. By promoting both forward and backward linkages with the domestic economy, additional employment is indirectly created and further economic activity stimulated (AL Samara, 2009).

Modern finance and economics have been concerned with the effects of changes in exchange rates on returns and cash flows of corporations (Bergen, 2010). After the collapse of the Bretton Woods System in the mid-1970s, most corporations throughout the world viewed exchange rates as significant risk factor (Black and Tarassova, 2000). This is especially the case in those industries that have been subject to substantial globalisation (Bartram et al. 2010). The changes in exchange rates have an impact on domestic and international corporations that can be defined as the 'exposure' of the corporation to fluctuating foreign exchange rates. The exposure to foreign exchange rate fluctuations usually manifests itself as an impact on first the value of net monetary assets

with fixed nominal payoffs' and secondly the value of real assets held by the firm (Bergen, 2010).

As many developing countries have or are considering implementing changes in their development strategies, now is an opportune time to investigate the issue of weather alteration, in exchange rate arrangement have an effect on economic growth or to what extent exchange rate volatility may be responsible for variation in the rate of economic production. Because such moves are accompanied by increase in the volatility of both, nominal and real exchange rates (Stancik, 2007).

### **1.1.1 Exchange Rates Volatility**

“Exchange rate” is the price of one currency in relation to another. In a slightly different perspective, it expresses the national currency’s quotation in respect to foreign ones. Thus, exchange rate is a conversion factor, a multiplier or a ratio, depending on the direction of conversion. It is believed that if exchange rates can freely move, it may turn out to be the fastest moving price in the economy, bringing together all the foreign goods with it. In the Otani, Shiratsuka and Shirota (2003) literature, (most of the time) volatility comes with the exchange rate. Volatility is defined as “instability, fickleness or uncertainty” and is a measure of risk, whether in asset pricing, portfolio optimization, option pricing, or risk management, and presents a careful example of risk measurement, which could be the input to a variety of economic decisions. Volatility of exchange rates describes uncertainty in international transactions both in goods and in financial assets. Exchange rates are modeled as forward-looking relative asset prices that reflect

unanticipated change in relative demand and supply of domestic and foreign currencies, so exchange rate volatility reflects agents 'expectations of changes in determinants of money supplies, interest rates and incomes (Omojimite and Akpokodje, 2010).

According to Cote, (2005) foreign exchange rates helps fill the domestic revenue-generation gap in a developing economy, given that most developing countries' governments do not seem to be able to generate sufficient revenue to meet their expenditure needs. Exchange rate movements have been a big concern for investors, analyst, managers and shareholders since the abolishment of the fixed exchange rate system of Bretton Woods in 1971. This system was replaced by a foreign rates system in which the price of currencies is determined by supply and demand of money. Given the frequent changes of supply and demand influenced by numerous external factors, this new system is responsible for currency fluctuations (Grier and Mark, 2010). These fluctuations expose companies to foreign exchange risk. Moreover, economies are getting more and more open with international trading constantly increasing and as a result nations are become more exposed to foreign exchange rate fluctuations. Foreign exchange volatility is the sensitivity of changes in the real domestic currency value of assets, liabilities or operating incomes to unanticipated changes in exchange rate (Dufour, 2010). Generally, economies are exposed to three types of foreign exchange risk: accounting (translation) volatility, transaction (commitment) volatility and economic (operational, competitive or cash flow) volatility (Eiteman et al., 2006).

### **1.1.2 Inflation Rates**

According to Mishkin (2008) inflation is the rate at which the general level of prices for goods and services is rising, and, subsequently, purchasing power is falling. Central banks attempt to stop severe inflation, along with severe deflation, in an attempt to keep the excessive growth of prices to a minimum. High inflation levels in many developing countries have been a cause of concern to their central banks. This has led to the adoption of monetary policy frameworks such as inflation targeting to help lower inflation to more sustainable levels. The determinants of inflation are important factors to consider when looking at the different monetary policy frameworks to adopt. One of the major determinants of inflation is exchange rate movements and the degree of sensitivity of domestic prices to these movements. Formally, this is known as exchange rate pass-through (ERPT). Akofio-Sowah (2009) defines it as the percentage change in the local currency import prices resulting from a one percent change in the exchange rate between the importing and the exporting country. When import prices respond fully to exchange rate movements, that is, at a hundred percent level, pass through is said to be complete. However if there is a less than hundred percent response of prices, it means that pass through is incomplete.

The effects of high inflation on the economy are generally considered to be predominantly harmful. Since the 1970s policy makers have been saddled with the responsibility of reducing and stabilizing the inflation rate. Inflation can be decomposed into two, namely: demand side inflation and the supply side inflation. For an open economy like Kenya, inflation comes from both domestic factors (internal pressures) and

overseas factors (external pressures). The external factors results from increase in the world prices of commodities or fluctuation in the real exchange rate. However, the influence of exchange rate on inflation is a function of the exchange rate in the country (Rotichet, 2007). The exchange rate regime plays a key role in reducing the risk of fluctuations in the Real Exchange Rate (RER) which will affect the rate of inflation and hence the entire economy.

### **1.1.3 Effect of Exchange Rate Volatility on Inflation Rates**

Exchange rate movements can influence domestic prices via their effect on aggregate supply and demand. On the supply side, exchange rates could affect prices paid by the domestic buyers of imported goods directly. In an open small economy (an international price taker), when the currency depreciates it will result in higher import prices and vice versa. Exchange rate fluctuations could 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). Further import-competing firms might increase prices in response to an increase in foreign competitor price in order to improve profit margins.

The extent of such price adjustment depends on a variety of factors such as market structure, nature of government exchange rate policy, or product substitutability. Exchange rate variations can also affect aggregate demand. To a certain extent, exchange rate depreciations (appreciations) increase (decrease) foreign demand for domestic goods and services, causing increase (decrease) in net exports and hence aggregate demand

(Obstfeld and Rogoff, 1995). This may increase real output. Furthermore, the expansion in domestic demand and gross national product may bid up input prices and accelerate wage demands by workers seeking higher wages to maintain real wages. The nominal wage rise may result in further price increases.

## **1.2 Research Problem**

Many developing economies have experienced high exchange rate volatility. This translates into a high degree of uncertainty for the two main monetary policy objectives that policymakers often seek to achieve: price stability and economic growth. Volatile exchange rates are associated with unpredictable movements in the relative prices in the economy. Therefore, exchange rate stability is one of the main factors that promote total investment, price stability and stable economic growth (AL Samara, 2009).

Foreign exchange rate uncertainty can have negative effects on both domestic and foreign investment decisions. It causes reallocation of resources among the sectors and countries, between exports and imports and creates an uncertain environment for investment. Two branches of macroeconomic theory relate to the question of how exchange rate volatility affects macroeconomic performance (Kiptoo, 2007). The first examines how the domestic economy responds to foreign and domestic real and monetary shocks under different exchange rate regimes. The second focuses on the issue of how exchange rate volatility under flexible exchange rate regimes affects international trade. In the case of free mobility of capital, an economy that is affected mainly by shocks to the LM curve (The LM curve shows the combinations of interest rates and levels of real income for which



the money market is in equilibrium), due to changes in money demand for example, will experience large fluctuations in output, inflation, and the exchange rate if the exchange rate is flexible (Rotich, 2007).

Given the Kenya economy resource base, the country's foreign exchange rates policy should move towards attracting and encouraging more inflow of foreign exchange (Musyoki et al., 2010). The need for foreign exchange rates is born out of the under developed nature of the country's economy that essentially hindered the pace of her economic development. Generally, policy strategies of the Kenya government towards foreign exchange rates are shaped by two principal objectives of the desire for economic independence and the demand for economic development.

Exchange rate movement in Kenya has been variable with periods of rapid depreciation of the domestic currency Kenya Shilling, which adversely affect the Kenyan economy. Even though studies have been conducted on the exchange rate and the implications for macroeconomic management as well as managing foreign exchange risk (Musyoki et al., 2010), very little has been done on the study of the foreign exchange rates volatility in Kenya. A few studies have been done in Kenya on the foreign exchange risk; Wambua (2006) did a study on an assessment of the casual relationship between interest rates and foreign exchange rates and Ngugi and Kabubo (1998) conducted an empirical study of spot market efficiency on Kenya's foreign exchange bureaus. In Tanzania, the researcher also identified Mbire and Atingi (1997) who did a study on a survey of foreign currency risk awareness and management practices in Tanzania, a research study supported by a

grant from the Investment Climate and Business Environment Research Fund, jointly funded by Trust Africa and IDRC. According to the researcher's relevant literature review, there is no evidence of local study in Kenya conducted on foreign exchange rates volatility on inflation in Kenya. This study seek to fill the existing research gap by answering what is the effect of exchange rate volatility on inflation rates in Kenya?

### **1.3 Research Objective**

To investigate the effect of exchange rate volatility on inflation rates in Kenya

### **1.4 Value of the Study**

This study is expected to significantly add value to the following:

#### **1.4.1 Central Bank of Kenya**

The findings of this study are expected to be of great help to Central Bank of Kenya's in making future policies on the regulation of the foreign exchange markets. Central bank has a primary role to play in manage the nation's money supply (monetary policy), managing inflations through active duties such as managing interest rates and foreign exchange rates.

#### **1.4.2 Commercial Banks in Kenya**

The Kenyan Commercial banks would also benefit from the findings of this study since they will have a better understanding on the actual policies that CBK employs to manage or intervene in the foreign exchange market. This would motivate and prompt them to

play part in ensuring calm and order in the foreign exchange markets. Currently there are forty four registered commercial banks in Kenya as at end of 2012.

### **1.4.3 Scholars and Researchers**

This study is also expected to add more knowledge in the area of foreign exchange volatility determinants and interventions made by central bank to bring normalcy on exchange rates. Other researchers will also benefit from this study as it will open up new areas for research.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter review relevant theories and literatures on the basis of which analysis of empirical data from the field is made and are core activities of any researcher in the social sciences. The section presents review of related literature in line with the objective stipulated in the first chapter. Finally, the chapter presents summary of literature and theories that the study will fill.

### **2.2 Theoretical Review**

Theories on the determinants of inflation have mainly been based on the root factors that push forth the general prices in the market; first is the excess-demand of the goods and services in the market secondly is the cost of production and finally the effects of foreign trade across borders.

#### **2.2.1 Excess-Demand Theories of Inflation**

The excess-demand theories argued that excess demand for goods and services over supply in an economy is the main source of inflation. This view that was implicitly reflected in the Phillips empirical study in the late 1950s, which showed a trade-off between unemployment and inflation (the Phillips curve), led the monetarists to search for a theory that can explain the existence of excess-demand to propagate inflationary conditions. In their search for the causes of excess-demand in an economy, the monetarists adopted the quantity theory of money as their point of departure. The original quantity theory is expressed by fisher's equation of exchange as; (Curwen, 1976).

$$MV = PT$$

Where ( $M$ ) is the money stock in the economy, ( $V$ ) represents the velocity of money circulation, ( $P$ ) is the average price level and ( $T$ ) represents the number of transactions in the economy. The classical economists assumed that ( $V$ ) is constant over time and that the economy is at its full employment level, meaning that ( $T$ ) is also constant. Under these restrictions, it implies that changes in the money stock ( $\Delta M$ ) directly affect changes in the price level. Also, the monetarists with Friedman (1956) as its chief advocate followed the same line of argument as their predecessors (the classical economists). They only differ in respect to the assumptions on ( $V$ ) and ( $T$ ). Friedman, consider that money demand is one of the five main forms of holding wealth (other forms of holding wealth are; equities, bonds, physical goods and human capital) and that any significant change in any of the other forms of wealth would cause velocity of circulation to vary, but only in the long- run.

Based on the fact that velocity of circulation does not change in the short-run but does in the long-run in a steady manner, Friedman concluded that, money supply and velocity of circulation could be treated as existing independently of one another. Considering this as the case, he concluded that, money national income ( $Y = T$  in the original quantity theory) could be traced almost exclusively to changes in the money supply (Johnson, 1971). This argument by the monetarists therefore suggests that in the long-run, growth in the money national income could only be achieved through adherence to steady long-term growth in the money supply.

Based on this, since velocity of circulation is constant in the short-run, it implies that changes in money national income ( $Y$ ) must be equal to and move in the same direction as money supply changes, if the price level is to remain steady. This implies that any increases in money supply beyond the increases in money national income will lead to increases in the general price level. Hence when the rate of growth in money supply is greater than that of gross domestic product in the long run, inflation is the ultimate result. Friedman concluded by saying that inflation is always and everywhere a monetary phenomenon.

Johnson (1971) also introduces international aspect of inflation into the monetarist theory of inflation. He argued that under fixed exchange rate regime when a country expands its domestic demand via increases in the domestic money supply, the excess demand generated will not only be on domestic products but also on imports. Due to this kind of spill over of excess demand, it means that inflationary pressure generated by increases in money supply will be shared between the domestic sector and the foreign sector. However, He pointed out that the extent of the spillover effects depends on the size and the marginal propensity to import by the domestic country where the excess demand originated. This re-enforces Friedman's statement that inflation is always a monetary phenomenon.

The other excess-demand theory of inflation is the Keynesians theory of inflation. Their ideas evolved from Keynes-Smithies ideas on inflation, basically the inflation gap model.

The Keynesians argued that, excess demand for goods and services result in inflation which is in line with the monetarist theory, but they differ in respect to what generate the excess demand in the economy. For the Keynesian, excess-demand is the result of increases in aggregate demand in the economy rather than just increases in money supply. They argued that, money supply is only one of the components of aggregate demand and therefore cannot solely be responsible for increases in the general price level; rather it is aggregate demand that entirely influences inflationary situations in a country. Keynesians believe that, factors that influence aggregate demand in the economy (money supply inclusive) are responsible for the persistent rise in price levels in an economy (Friedman, 1956).

### **2.2.2 Structuralists / Cost-Push Theory of Inflation**

The cost-push theory of inflation is a generic term for Marxists, Structuralists and Keynesians theories of inflation that are not based on excess-demand influences in the economy. In this group of theories of inflation, a host of non-monetary supply oriented factors influencing the price level in the economy are considered. Thus cost-push causes of inflation result when cost in production increases independently on aggregate demand. The Keynesians argued that wage mark-up via trade unions lead to increases in the cost of production. For the affected firms in this regard to maintain their profit margins, they will have to increase prices of their products. The increases in the prices will further put pressure on the trade unions to press for higher wages which will ultimately lead to further increases in prices and the process continue in that circular manner, known as the price-wage spiral. The extent to which price-wage spiral affect the increases in the

general price level (inflation) depends on the power of trade-unions relative to employers association (Black and Tarassova, 2000). The Keynesians went on to point out that when firms gain more market power, they will be able to push up prices independently in order to make profit. This is the case when markets are concentrated and move towards monopoly or oligopoly through mergers.

Laughlin 1909 views in his article in the journal of political economy. He started by rejecting the monetarist explanation of inflation. Instead, he proposed that the causes of inflation must be sought in the (real) forces settling particular prices Structuralists believe that, conflicts over the distribution of income between capital and labour, between landowners and peasants, between different producers in different sectors, is the main cause of inflation. This is due to the fact that demand for higher income by one of the following groups (labour, landowners and different producers in different sectors) in excess of their productivity can only be achieved by each of the other groups (firms, peasants and different producers in different sectors) via increases in prices of their products (Berle and Means 1932).

The structuralists also consider currency depreciation as an essential part in explaining inflationary situations. This is due to the fact that, in the structuralists' production process, emphasis is placed on capital input. This implies that in countries where there is lack of foreign reserves; currency depreciation becomes a serious problem with or without foreign exchange control. The currency depreciation leads to high cost of



imported raw materials for production, which are ultimately passed onto higher prices for goods and services. Besides, Structuralists such as Pazos (1972), Arida and Andre (1985) also pointed out that inflation is generally caused by inertia. Inflation inertia is a process where the current inflation rate is determined by its past history. This is generally caused by inflationary expectations, relative price adjustments, institutional adjustments that support the indexation of wages, financial contracts, monetary and exchange rate policy frameworks.

### **2.2.3 The Balance of Payments Theory**

The balance of payments theory of exchange rate is also named as 'General equilibrium theory of exchange rate. According to this theory, the exchange rate of the currency of a country depends upon the demand for and supply of foreign exchange. If the demand foreign exchange is higher than its supply, the price of foreign currency will go up. In case, the demand of foreign exchange is lesser than its supply, the price of foreign exchange will decline (Kanamori and Zhao, 2006). The demand for foreign exchange and supply of foreign exchange arises from the debit and credit items respectively in the balance of payments. The demand for foreign exchange comes from the debit side of balance of payments. The debit items in the balance of payments are (1) import of goods and services (2) Loans and investments made abroad (Kanamori and Zhao, 2006).

The supply of foreign exchange arises from the credit side of the balance of payments. It is made up of the exports of goods and services and capital receipts. If the balance of payments of a country is unfavorable, the rate of foreign exchange declines. On the other

hand, if the balance of payments is favorable, the rate of exchange will go up. The domestic currency can purchase more amounts of foreign currencies (Kanamori and Zhao, 2006). When the exchange rate of a country falls below the equilibrium exchange rate, it is a case of adverse balance of payments. The exports increase and eventually the adverse balance of payment is eliminated. The equilibrium rate is restored. When the balance of payments of a country is favorable, the exchange rate rises above the equilibrium exchange rate resulting in the decline of exports (Kanamori and Zhao, 2006).

### **2.3 Determinants of Inflation**

Over the years, there have been a considerable number of empirical researches in the field of inflation. Most of the works were directed towards the establishment of the causal agents (determinants) of inflation. One aspect of the relationship between trade and exchange rate volatility that needs to be mentioned is the role of “sunk costs.” Much of international trade consists of differentiated manufactured goods that typically require significant investment by firms to adapt their products to foreign markets, to set up marketing and distribution networks, and to set up production facilities specifically designed for export markets. These sunk costs would tend to make firms less responsive to short-run movements in the exchange rate, as they would tend to adopt a “wait and see” approach and stay in the export market as long as they can recover their variable costs and wait for a turnaround in the exchange rate to recoup their sunk costs. Following the finance literature on real options (Kanamori and Zhao, 2006), Reyes (2007) and Mishkin (2008) have explored the implications of sunk costs in the context of an “options” approach, which has been applied by Vigfusson et al. (2009).

The key idea is that an exporting firm can be viewed as owning an option to leave the export market, and a firm not currently exporting can be regarded as owning an option to enter the foreign market in the future. The decision to enter or exit the export market involves considering explicit fixed and variable costs, but also the cost of exercising the option to enter or leave the market (Gust et al. 2010; Marazzi and Sheets 2007). The greater the volatility in exchange rates, the greater the value of keeping the option, and hence the greater the range of exchange rates within which the firm stays in the export market, or stays out if it has not yet entered. This suggests that increased exchange rate volatility would increase the inertia in entry and exit decisions (Taylor, 2000)

In the theoretical literature, the new-structuralists such as Arida (1985) and Pazos (1972) argued that inflation is generally caused by inertia. In regard to this, Arida and Frasicisco (2005) conducted an empirical research on this. Their study, which was an IMF working paper, was conducted on “does political instability lead to higher inflation?” In their study, they combined generalized method of moment’s system (GMM) estimation which was applied to dynamic panel data of 100 countries for the period (1960-99). Results of the study showed that a higher degree of political instability (which is measured by using several political and institutional variables) generates higher inflation rates and seignior age. They also pointed out that the preparative mechanism of political instability in causing higher inflation levels are more pervasive and stronger in developing countries than developed countries which have low inflation levels. One argument put up by structuralists in their theory of inflation is that, deficit financing by the banking sector is inflationary. Based on this, Fisher et al (2002) in their research pointed out that the

relationship between fiscal deficit and inflation is only strong in high inflation countries but find no obvious relationship between fiscal deficit and inflation in low inflation countries.

## **2.4 Determinants and Effects of Exchange Rates Volatility**

Much of the literature on the economic effects of exchange rate volatility focuses on the long term, because the analysis is intended to study impacts of exchange rate volatility on longer-term decisions related to foreign direct investment (Kanamori and Zhao, 2006). Measures of border-width effects based on changes of relative prices between cities are affected by the short-term change in the nominal exchange rate. If exchange rate pass-through is declining over time, the impact of inflation targeting on exchange rate volatility is likely to be felt at a higher frequency. Essentially, the exchange rate will be affected by shocks to the domestic inflation rate.

A comprehensive study of exchange rate volatility was conducted by Murray, van Norden, and Vigfusson (1996). They concluded that the popular perception of increased exchange rate volatility was not supported by the data. The authors looked at trends in exchange rate volatility over time and compared volatility in currency markets to that in markets for other assets such as equities. They attributed exchange rate volatility to trader's looking to market fundamentals rather than to potentially destabilizing noise traders.

### **2.4.1 Effect of Exchange Rate Volatility on Inflation Rates**

Most of studies on devaluation of the nominal exchange rate and pass-through to consumer price inflation have been carried out in developed economies (Neiman 2010; Burstein et al.2007), among others. However, there is still a dearth of knowledge with regard to similar work in less developing economies. The question often asked is what causes an incomplete or low exchange rate pass-through to import and thereby to consumer prices (Gust et al.2010). Several studies using different methods and data to explain the exchange rate impact on inflation agree that in recent years the pass-through has declined implying that a depreciation of the nominal exchange rate led to less than 100 percent increase in consumer price inflation (Gust et al.2010; Neiman 2010). But they differ in the explanation of the causes of the incomplete pass-through. As a consequence, various hypotheses have been put forward explaining reasons for low pass-through to imports or consumer price inflation. The general hypothesis reported by most studies is that the decline in the pass-through was due to competition in production of products, and trade integration particularly with China (Marazzi and Sheets 2007).

Several studies using different methods and data to explain the exchange rate impact on inflation agree that in recent years the pass-through has declined implying that a depreciation of the nominal exchange rate led to less than 100 percent increase in consumer price inflation (Mishkin 2008; Reyes 2007). But they differ in the explanation of the causes of the incomplete pass-through. As a consequence, various hypotheses have been put forward explaining reasons for low pass-through to imports or consumer price inflation. The general hypothesis reported by most studies is that the decline in the pass-

through was due to competition in production of products, and trade integration particularly with China (Gust et al.2010; Marazzi and Sheets 2007).

Taylor (2002) and Corsetti et al. (2008) examine the broad effect of exchange rate pass-through to consumer price inflation. In addition, some studies have focused on export prices 'price to market' the exporter set prices using the currency of the country which goods are being exported. Study by Miljkovic et al. (2003) show evidence that low inflation and prudent monetary policy led to incomplete or low exchange rate pass-through, which in turn, led to a positive effect on persistent price and cost increases. Vigfusson et al.(2009) using 1980s data reported a pass-through coefficient of 55 percent for United States. Marazzi and Sheets (2007) observed that pass-through for the United States declined from 0.5 in the 70s and 80s to 0.2 in the last 10 years. These studies show that with improved trade integration and monetary policy the correlation between exchange rate pass-through and inflation is weak (Taylor 2000).

Causes of inflation differ from country to country; Lim and Papi (1997) argue that studies have shown that inflation is influenced in three ways. First, the monetary way, this is through growth of money stock. Second, it is argued that inflation originates from high government spending that exceeds revenues at a given time. The increase in debt and short fall of revenues lead governments to borrow from Central Banks, subsequently, increasing the money stock, and thereby inflation. Third, as previously mentioned, it is argued in the literature that inflation is as a result of devaluation of exchange rate.

Furthermore, the oligopolistic markets through price wars and collusions lead to inflation (Hegji 2003). In addition, labour unions create price-wage spiral, which lead to high inflation. Lim and papi (1997) carried out an empirical study for Turkey and examined the monetary, public finance and structural causes of inflation. Their results showed that the public finance variables had more influence on inflation process than other approaches. Moreover recent studies have emphasized the use of structural models to explain inflation and exchange rate pass-through (Corsetti et al.2008) used structural equations to examine both short run and long run exchange rate pass-through using the United States data and concluded that the pass-through were incomplete.

Rittenberg (1973) using the Granger causality tests showed that the causality is from price change to the exchange rate, rather than from the prove its competitiveness and require a devaluation of its real exchange rate, it is necessary to devalue the nominal exchange rate, in order to effect changes in the relative prices. However, devaluation could be eroded by inflation if the accompanying fiscal and monetary policies are not adjusted simultaneously to achieve the desire goal. Ghei and Hinkle, further assert that before devaluation of the nominal exchange rate, it is necessary to know the degree of misalignment between the real exchange rate and its equilibrium level. Otherwise if they are already aligned devaluation could lead to undesirable adjustment in the real exchange rate, they further assert that empirical studies have shown that devaluation often leads to inflationary pressure. But, only part of devaluation is transmitted (pass-through) to increases in consumer price inflation (Gust, Leduc and Vigfusson 2010,) the other part affects the real exchange rate (Edwards 1989).

### **2.4.2 Effect of Exchange Rate Volatility on Investment**

Alogoskoufis, (1992) suggested that developing countries that peg their exchange rates achieve lower inflation than those whose exchange rate floats (Collins, 1996). The most important reasons for a devaluation to trigger an aggregate demand contraction include: a redistribution of income towards those with high marginal propensity to save, a fall in investment, an increased debt burden, reduction in real wealth, a low government marginal propensity to spend out of tax revenue, real income declines under an initial trade deficit, increased interest rates, and increased foreign profits (Barbone and Rivera-Batiz 1987). On the other hand, aggregate supply may suffer after devaluation because of: more expensive imported production inputs, wage indexation programmes, costlier working capital (Bruno, 1979).

Increases in the volatility of the real effective exchange rate, exert a significant negative effect upon export demand in both the short-run and the long run and these effects may result in significant reallocation of resources by market participants. The issue is particularly important for countries that Switched from a fixed to a flexible exchange rate regime due to the higher degree of variability associated with flexible exchange rates (Arize, Osang, and Slottje, 2004).

The impact of exchange rate volatility on investment and hence on economic growth is not a recent source of concern. It is noted in the literature that uncertainty reduces investment in the presence of adjustment costs and when the investment process includes



irreversibility. Real exchange rate uncertainty creates an uncertain environment for investment decisions and therefore, investors delay their investment decisions to obtain more information about the real exchange rates if investments are irreversible and exerts negatively on economic performance. Campa and Goldberg (1993) found a negative impact of exchange rate volatility on investment. Whereas Aizenman (1992) finds positive relationship while Campa and Goldberg (1995) find almost no impact. Keeping such relationships in mind a hypothesis is developed relating to the link between exchange rate volatility and economic growth. It is considered an opportune time for such analysis because more and more countries are considering revisions in their exchange rate arrangements.

### **2.4.3 Effect of Exchange Rate Volatility on Trade**

The objective of our empirical analysis is to examine the role of exchange rate volatility in trade in a comprehensive manner. Compared to the existing academic literature and the Fund (1984) paper on the topic, the contribution of our analysis lies in exploring the effect of exchange rate volatility on trade along several dimensions: by the type of exchange rate volatility: by country group and by the type of trade. The role of exchange rate volatility has not yet been explored extensively using disaggregated trade data. In addition to the disaggregation of the volatility effect, we test its robustness to alternative ways of controlling for joint causality between trade and exchange rates and for trade-related factors other than exchange rate volatility. It is instructive to look at the time paths of world trade and exchange rate volatility, and examine if there is any obvious negative association between the two (Hegji 2003).

A relatively recent development in the theoretical foundation of the gravity model emphasizes “remoteness” or “multilateral resistance” effects. These effects were proposed by Anderson and van Wincoop (2003) and are defined as a function of unobservable equilibrium price indices, which depend on bilateral trade barriers and income shares of all the trading partners. In other words, the “multilateral resistance” effects are catch-all expressions that summarize the effects on a given bilateral trade from differential, possibly unobserved, trade costs between this country pair and all other trading partners (Lim and Papi, 1997). The gravity equation can then be interpreted as indicating that bilateral trade depends on the bilateral trade barrier between the two countries in question, relative to the two countries’ multilateral resistance indices: for a given bilateral trade barrier between the two countries, higher barriers between them and their other trading partners would reduce the relative price of goods traded between them, raising bilateral trade. In empirical applications, the multilateral resistance indices can be conveniently proxied by country effects (fixed or time varying) (Mishkin 2008; Reyes 2007).

## **2.5 Empirical Review**

Aghevli and Khan (1978) also developed a model with both monetarist and structuralist features. In their model, fiscal deficit was considered as the original force and the propagating mechanism in the inflationary process. One argument put up by structuralists in their theory of inflation is that, deficit financing by the banking sector is inflationary.

Chhibber et al (1989) developed a detailed econometric model of inflation for Zimbabwe. In their model, both structuralists and monetary factors of inflation were included. In the study, they showed that nominal monetary growth, foreign prices, exchange and interest rates, unit labour costs and real income are the determinants of inflation in Zimbabwe.

Elbadawi (1990) conducted a research on the effect of exchange rate volatility on inflation in Uganda during the period 1988- 89. His work revealed that rapid monetary expansion and the depreciation of parallel exchange rate were the principal determinants of inflation in Uganda. Tegene (1989) on the other hand adopted Granger and Pierce causality test in order to establish the role of domestic money supply on inflation in six African countries. Evidence from the study indicated a unit-directional causality from monetary growth to inflation.

Karfakis and Kim (1995) using Australian exchange rate data found that unexpected current account deficit is associated with exchange rate depreciation, and a rise in interest rates. Evidence is found that current account deficits diminishes domestic wealth, and may lead to overshooting of exchange rates. A fall in the real value of currency was also reported by Obstfeld and Rogoff (1995).

In the late 1990s, Agenor and Montiel (1996) pointed out that exchange rate depreciation only have a short-run impact on inflation in small, open developing countries. They also

pointed out that very high inflation rates result, when large unsustainable deficits are financed by money creation.

Ngugi and Kabubo (1998) conducted an empirical study of spot market efficiency on Kenya's foreign exchange bureaus. There has also been a surge and collapse in international capital flows into developing countries in the recent decades. Sudden outflow of capital is another major concern when it can drastically affect exchange rates as were witnessed during several financial crises of Brazil, East Asia, and Mexico. These capital outflows affect domestic output, real exchange rates, capital and current account balances for years after the crises.

A research conducted by Laryea and Sumaila (2001) on the determinants of inflation in Tanzania established that in the short-run, output and monetary factors are the main determinants of inflation in Tanzania. They also pointed out that in the long-run, parallel exchange rate also influences inflation. In their conclusion, they emphasized that; inflationary situation in Tanzania is basically a monetary phenomenon.

Based on this, Fisher et al (2002) in their research pointed out that the relationship between fiscal deficit and inflation is only strong in high inflation countries but find no obvious relationship between fiscal deficit and inflation in low inflation countries.

As a general rule, a country with a consistently lower inflation rate exhibits a rising currency value, as its purchasing power increases relative to other currencies. During the last half of the twentieth century, the countries with low inflation included Japan, Germany and Switzerland, while the U.S. and Canada achieved low inflation only later. Wambua (2006) did a study on an assessment of the casual relationship between interest rates and foreign exchange rates. Those countries with higher inflation typically see depreciation in their currency in relation to the currencies of their trading partners.

Inflation and exchange rates are all highly correlated. By manipulating interest rates, central banks exert influence over both inflation and exchange rates, and changing interest rates impact inflation and currency values. Higher interest rates offer lenders in an economy a higher return relative to other countries. Therefore, higher interest rates attract foreign capital and cause the exchange rate to rise. Musyoki et al., (2010) conducted on the exchange rate and the implications for macroeconomic management as well as managing foreign exchange risk.

The impact of higher interest rates is mitigated, however, if inflation in the country is much higher than in others, or if additional factors serve to drive the currency down. The opposite relationship exists for decreasing interest rates - that is, lower interest rates tend to decrease exchange rates (Bergen, 2010).

## **2.6 Summary of Literature Review**

This study has found mixed results regarding significant foreign exchange exposures, perhaps, as many multinational companies effectively hedge against many foreign exchange risks using financial and operating procedures. In general, it seems counter-intuitive to most managers that domestic companies that are not engaged in international transactions would be exposed to exchange rate changes. From the Keynesian and the structuralist theories of cost-push causes of inflation, the following general factors can be identified as the agents of inflation; wage increases by trade unions, profit motives of firms that gain market power, increase in the prices of raw materials imported from abroad through currency depreciation and price increase in the world commodity market, structure of landownership, inertia, taxes such as value added tax (VAT) and the presence of external shocks such as a dramatic change in oil prices, crop failure and war. However the theories did not address cross-border convergence of prices, monetary policy rule, shilling trade against foreign currency and level of aggregation of trade flows. Among the many academic publications and articles, there is still a notable gap in this research study that has been undertaken to date in the context of inflation rates which has helped to gather some valuable information. This study therefore serves as a springboard for future researchers to investigate and widen their scope on the effect of inflation rates on the exchange rates among commercial banks.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter sets out various stages and phases that were followed in completing the study. It involved a blueprint for the collection, measurement and analysis of data. In this stage, most decisions about how research was executed and how respondents were approached, as well as when, where and how the research was completed. Therefore in this section the research identified the procedures and techniques that were be used in the collection, processing and analysis of data. Specifically the following subsections were included; research design, target population, sampling design, data collection instruments, data collection procedures and finally data analysis.

### **3.2 Research design**

Research design is the plan and structure of investigation so conceived as to obtain answers to research questions. The plan is the overall scheme or program of the research (Robson, 2002). In this study a descriptive design was used. This research problem could best be studied through the use of a descriptive design. Descriptive research portrays an accurate profile of persons, events, or situations (Saunders, Lewis and Thornhill, 2003). Descriptive design allows the collection of large amount of data from a sizable population in a highly economical way. Therefore, the descriptive survey was deemed the best strategy to fulfill the objectives of this study. This study covered a period of less than 10 years i.e. (2003 - 2013).

### **3.3 Data Collection**

Data collection is gathering empirical evidence in order to gain new insights about a situation and answer questions that prompt undertaking of the research (Kothari, 2004). In this research, secondary data was collected from Central Bank of Kenya. The average annual exchange rates and inflation rates for the period of study have been employed.

### **3.4 Data Analysis**

Data collected was sorted, classified and coded then tabulated for ease of analysis. The data was summarized and categorized according to common themes. Data collected was analyzed using frequency distribution tables, descriptive statistics and inferential statistics. The SPSS (version 17) computer software aided the analysis as it is more user friendly. The data was entered into the Statistical Package for Social Sciences (SPSS).

The study used USD over Kenyan Shilling since it is the major currency in trade globally. The USD is highly favoured due to its stability against other world currencies. Other major currencies like Euro are highly susceptible to economic distortions in the European region. This study used Time series analysis. It is a statistical technique that deals with time series data. Time series data means that data is in a series of a particular time period. The research collected the data from central banks and established the average of each year. We collected a set of observations on the values that a variable takes at different times. The analysis used Auto Regressive Integrated Moving Average (ARIMA) models describe the current behavior of variables in terms of linear relationships with



their past values. A multivariate regression model was applied to determine the relative relationship between exchange rate volatility and Inflation rate.

### **3.4.1 Analytical Model**

The regression model was as follows:

$$y = a + \beta_1 X_1 + \epsilon$$

**Where:**

Y = Inflation Rate

a = Constant Term

$\beta_1$  = Beta coefficients

$X_1$  = Exchange rate

$\epsilon$  = error term

In the test of significance the researcher used various tools. ANOVA was most preferred in the study because it can be used to examine differences among the means of several different groups at once. Since ANOVA is used to test independent variables, the researcher opted to use it. The t-test determines the strength of the relationship between exchange rate and inflation.

The correlation coefficient, R, is a measure of the linear relationship between two variables. The coefficient of determination (R square) measures the proportion of variability in a data set that is accounted for by a statistical model.

## CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

### 4.1 Introduction

This chapter presents analysis and findings of the research study.

### 4.2 Diagnostic tests

Regression tests were carried out as a prior diagnosis of the movement of the variables.

**Table 4.1: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.453 <sup>a</sup>	.205	.117	5.5358

**Source: Research Findings**

The correlation coefficient, R, is a measure of the linear relationship between two variables. The value of 0.453 indicates that there is a moderate correlation between foreign exchange rates volatility and inflation rates. The coefficient of determination (R square) measures the proportion of variability in a data set that is accounted for by a statistical model. In this case it can be seen that there is weak relationship between exchange rates and inflation. Only 20.5% of the variation in inflation is explained by movement in exchange rates.

The adjusted R square gives a positive value; this translates to the fact that exchange rates assist in predicting the value of inflation. Standard error of the estimate is a measure of

the accuracy of predictions, with a high figure of  $\pm 5.5358\%$  on indicating a huge range in predicting inflation rates using foreign exchange.

**Table 4.2: ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	71.263	1	71.263	2.325	.162 <sup>a</sup>
	Residual	275.809	9	30.645		
	Total	347.073	10			
a. Predictors: (Constant), Exchange rate						
b. Dependent Variable: Inflation Rate						

**Source: Research Findings**

Analysis of variance (ANOVA) is a method of testing the null hypothesis that several group means are equal in the population, by comparing the sample variance estimated from the group means to that estimated within the groups. Sum of squares measures the variability of a data set. Given our regression model on the sum of squares of 71.263, is smaller than residual of 275.809, we can conclude that our model does not accounts for most of the variation on the dependent model, which means most of the variation of inflation is not because of exchange rate variation. We use the F statistic and significance level to measure if the regression model fits well. Pegging the significance level at 0.05 we see that the exchange rates are insignificant in determining inflation rates.

**Table 4.3 Regression Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	40.894	19.500		2.097	.065
	Exchange rate	-.377	.247	-.453	-1.525	.162

a. Dependent Variable: Inflation Rate

**Source: Research Findings**

The t-test determines the strength of the relationship between exchange rate and inflation. Using t-statistic table, the  $t_{.95}$  the relationship can be seen to be strong, negative but not significant. The unstandardized coefficients are the coefficients of the estimated regression model, while the standardized ones are where the error has been adjusted for.

The overall equation can be stated as:

$$I_R = 40.894 - .453E_x + 19.500e$$

Where

$I_R$  = Inflation Rate

$E_x$  = Exchange Rates

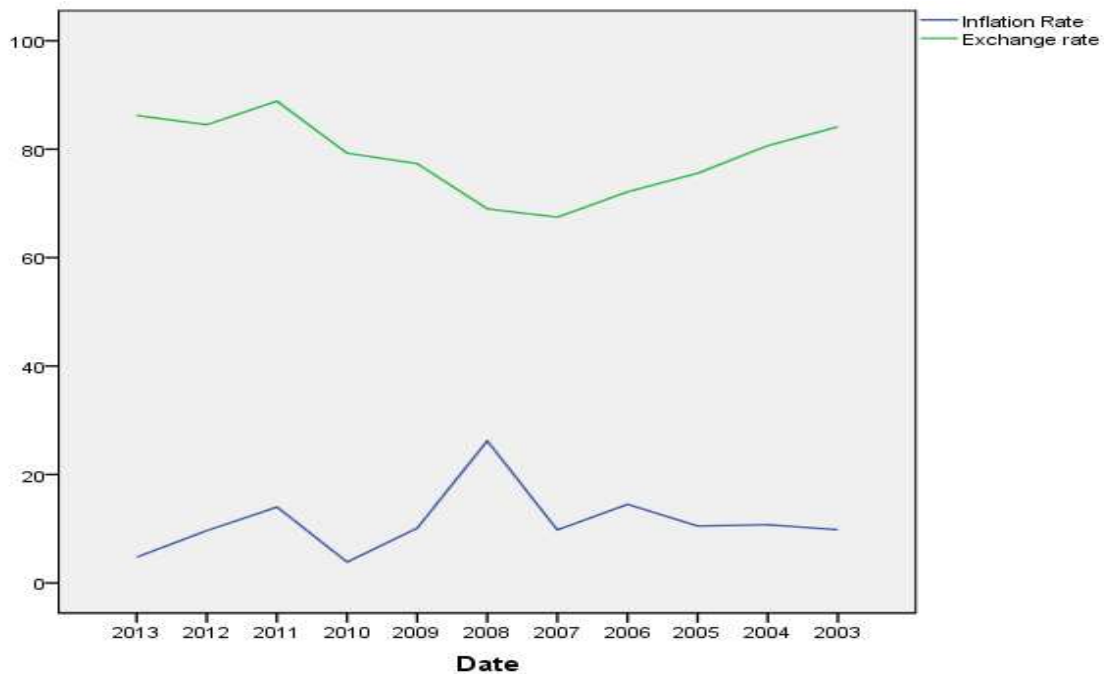
e = error

From this equation we can therefore conclude that increase in exchange rates reduces inflation rate by 0.453. This is because exchange rates were expressed as in terms of one USD per Kshs.

### 4.3 Time Series

We first have to draw the graph of the inflation rate and inflation movement over the ten years to determine if they depict any season variations.

**Figure 4.1 Time Series**



**Source: Research Findings**

The series exhibits a number of peaks, but they do not appear to be equally spaced. This output suggests that the series has no periodic component but exhibits erratic movements.

Typical erratic movement can be seen during the year 2007 and 2008. Thereafter the series exhibit an upward move. It therefore appears that unpredictability is a prominent feature for both movement in inflation and exchange rates.

#### 4.4 Auto Regressive Integrated Moving Average

ARIMA was calculated to determine movement in exchange rates versus inflation rates.

**Table 4.4: Model Fit**

<b>Fit Statistic</b>	<b>Mean</b>
R-squared	0.205
RMSE	5.536
MAPE	42.234
MaxAPE	184.459
MAE	3.654
MaxAE	11.299
Normalized BIC	3.858

**Source: Research Findings**

Using ARIMA, we can state the following on the data set:

First the positive Stationary R-squared and R-Squared mean that the model under consideration is better than the baseline model. This is in effect stating the exchange rates impacts volatility of inflation.

The Root Mean Square Error (RMSE) which is used to measure the difference between the predicted values and the actual values. It is expressed in the same units as the dependent series. A value of 5.536 variation on the inflation rate shows that a low level of accuracy.

Also third using the Mean Absolute Percentage Error (MAPE) which is used to measure how accurately constructed values fit in a time series statistic for trend estimation. In this case we can see a moderate figure of 42.234% in using Exchange rates to predict the volatility of inflation rates.

Fourth using the Maximum Absolute Percentage Error (MaxAPE) which measures the maximum inaccuracy exchange rates were on predicating movement in inflation rates. In this case we can see there were some scenarios where exchange rates were off by up to 184.459% in predicting inflation rates.

The Maximum Absolute Error (MAE) – Measures how much the series varies from its model-predicted level. MAE is reported in the original series units. A MAE of 3.654% on the inflation rates level shows that this model provides a moderate level of accuracy

Also the Maximum Absolute Error (MAXAE) is the largest forecasted error, expressed in the same units as the dependent series. The worst possible scenario in using exchange rates to predict inflation rates is that it can be off by  $\pm 11.299$

While using the Normalized Bayesian Information Criterion (Normalized BIC) which is a general measure of the overall fit of a model that attempts to account for model complexity. This statistic would be important when comparing several factors affecting

the same dependent variable. Since we only have exchange rates, then we can ignore this statistic in coming up with our conclusions.

#### **4.5 Discussion and Interpretation of Findings**

Upon reviewing the R (squared) for this study it can be seen that there is weak relationship between exchange rates and inflation. Only 20.5% of the variation in inflation is explained by movement in exchange rates. From the ANOVA conducted our regression model on the sum of squares of 71.263, is smaller than residual of 275.809, we can conclude that our model does not accounts for most of the variation on the dependent model, which means most of the variation of inflation is not because of exchange rate variation. We use the F statistic and significance level to measure if the regression model fits well. Pegging the significance level at 0.05 we see that the exchange rates are insignificant in determining inflation rates.

The t-test determines the strength of the relationship between exchange rate and inflation. Using t-statistic table, the  $t_{.95}$  the relationship can be seen to be strong, negative but not significant. Therefore the relationship between exchange rates is found to be insignificant.



## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Introduction**

From the analysis and data collected the foregoing discussions, conclusions and recommendations were made. The response was based on the objectives of the study.

### **5.2 Summary**

The objective of the study was to investigate the effect of exchange rate volatility on inflation level in Kenya. The researcher data is for between the year 2003 to 2013 both for exchange rates and inflation. A regression analysis was carried out as preliminary analysis on the data. The test indicated that there was moderate relationship between foreign exchange rates volatility and inflation rates. On carrying out an Analysis of Variance tests (ANOVA) and at 95% confidence level, it was found out that there was an insignificant relationship between exchange rates volatility and inflation rates. Using the t-test it was noted that even though the relationship between the two is insignificant and negative, it was nevertheless, strong.

The study also modelled time series for the data and noted that both inflation rates and exchange rates exhibited seasonal variations. This was especially the case between the year 2007 and 2008 when both exhibited erratic movements though in the opposite direction which can be explained by the political situation in Kenya at the time. Using ARIMA models, it was noted that, that using exchange rates to predict inflation rates,

would provide a variation of  $\pm 5.536$  on the actual inflation. This provides a low level of accuracy given that annual inflation rates averaged 11%.

ARIMA model also indicated exchange rates would provide an accuracy of 42.234% in predicting the trend of inflation rates. Inaccuracies of using foreign exchange to predict inflation rates could lead to a worst possible rate of the prediction being off by 184.459%. In absolute figures, using exchange rates as predictor can be worse by  $\pm 11.299$ .

### **5.3 Conclusion**

From this study it has been demonstrated that even though there is a relationship between exchange rates and the relationship has a number of weaknesses. Exchange rates cannot be used to reliably predict movement in inflation rates. This is because the model used by the study showed there was an insignificant relationship between foreign exchange and inflation rates.

This study agrees, with Mishkin 2008, Reyes 2008, and Sheets 2007, who have shown that exchange rates effect on inflation rate has declined in the recent years. This study tends to agree with Gust et al. 2010, who showed that is a result of inflation of products from China. Kenya has strongly improved its economic ties with China and this growth of trade between the two countries has affected how the US dollar fluctuates with inflation. It is worth noting that China protects its currency from significant valuation with the US dollar.

## **5.5 Recommendations for policy**

While no significant relationship has been found to exist between exchange rates and inflation rates it may be advisable to the policy makers to take note of other macro economic variables which may suffer greatly if the exchange rates experience distortions. Exchange rates fluctuations may affect the Balance of Trade as the imports and exports of goods

## **5.6 Limitations of the Study**

Care must be taken to generalize the results of this study as there were some limitations. The use of regression analysis also means that there is an assumption of linearity with the various models which may not be the case. The researcher used only the USD exchange rates and therefore the relationship may not be the same if other major currencies were added in the model. Various other factors have been found to largely influence inflation and therefore a single factor study may not comprehensively the determinants of inflation.

## **5.7 Recommendations for Further Study**

The current study focused on the US dollar as the only currency on the exchange rates variation and compared it with inflation rates. To model a comprehensive study, future scholars should focus on using other alternate currencies such as the Euro to model this relationship.

The current study was conducted for a period when the exchange rate market had been liberalized. It may interesting for a study that compares the impact of exchange rates on inflation for a period before amendment of Exchange Rates Act in 1995 where the exchange rates were fixed by the government and after the free exchange market thereafter.

A study on the same variables is recommended for more developed economies were the market distortions are minimal.

## REFERENCES

- Agenor, P.&Montiel, P. (1996).*Development Macroeconomics*, Princeton, NJ: Princeton University Press
- Aghevli, B.&Khan G. (1996). Government Deficits and the Inflationary Process in Developing Countries, *IMF Staff papers* 25:383-416.
- Akofio-Sowah, N, (2009).Is there a link between Exchange Rate pass-through and the monetary regime: Evidence from Sub-Saharan Africa and Latin America. International Atlantic Economic Society.[Online]. Available: <http://www.springerlink.com> [Accessed 10 March 2010].
- AL Samara, M. (2009).The Determinants of Real Exchange Rate Volatility in the Syrian Economy.University Paris 1- Sorbonne, November.
- Anderson, G., James E., & Eric van Wincoop, (2003), Gravity with Gravitas: A Solution to the Border Puzzle,*American Economic Review*, 93 (1), March, 170-192.
- Arida, P.& Andre.T. (1985).*Inertia Inflation and Monetary Reforms in Brazil*, Edited by John Willianson.Washinton, DC: Institute for Economics.
- Arize, A.,&Slotte,D. (2004). Exchange Rate Volatility and Foreign Trade: Evidence from Thirteen LDCs. *Journal of Business and Economic Statistics* 18, 10–17.
- Barbone, L., & Rivera-Batiz,F. (1987), Foreign Capital and the Contractionary Impact of Currency Devaluation, With an Application to Jamaica. *Journal of Development Economics* 26, 1–15.
- Bergen, J. (2010). *Factors That Influence Exchange Rates*, Investopedia, <http://www.investopedia.com>
- Berle, A.& Means, C. (1932).The Modern Corporation and Private Property.1932.

- Black, B. & Tarassova, A. (2000). Russian Privatization and Corporate Governance: What went wrong? In: *Stanford Law Review*, 52 (2000) 4, P. 1731-1808.
- Bodnar, G., Dumas, R. & Marston, R. (2002). Pass-through and Exposure. *The Journal of Finance* LVII, 1, February.
- Bruno, M. (1979). Stabilisation and Stagflation in a Semi-industrialised Economy. In Rudiger Dornbusch and Jacob A. Frenkel (eds.) *International Economic Policy. Theory and Evidence*. Baltimore, 270–289.
- Burstein, A., Eichenbaum, S. & Rebelo, S. (2007). Modelling Exchange Rate Pass-through after Large Devaluations. *Journal of Monetary Economics* 54: 346-368.
- Campa, J., & Goldberg, L. (1999). Investment, Pass-through, and Exchange Rates: A Cross- country Comparison. *International Economic Review* 40:2, 287– 314.
- Chhibber, A., Cottani, J., Firuzabadi, D., & Walton, M. (1989): Inflation, Price Controls and Fiscal Adjustment in Zimbabwe, *World Bank working paper WPS 427*, World Bank, Washington D.C.
- Corsetti, G., Dedola, F. & Leduc, S. (2008). High Exchange-rate Volatility and Low Pass-through. *Journal of Monetary Economics* 55 : 1113 - 1128.
- Cote, A. (2005). Exchange Rate Volatility and Trade: A Survey, Working Paper 94-5, Bank of Canada.
- Curwen, P. (1976): *Inflation*, Macmillan Press LTD, London.
- Devereux, M. & Engel, C. (2002). Exchange Rate Pass-through, Exchange Rate Volatility, and Exchange Rate Disconnect. *Journal of Monetary Economics* 49: 913-940.

- Dufour, D., Jean-Marie, Q.&TessierD. (2010) On the Relationship between Impulse Response Analysis, Innovation Accounting and Granger Causality. *Economics Letters* 42, 327–333.
- Edwards, S. (1989). *Real Exchange Rate, Devaluation, and Adjustment*. Cambridge, Mass: MIT Press.
- Elbadawi, I. (1990). *Inflationary Process, Stabilisation and the Role of Public Expenditure in Uganda*. Mimeo, World Bank, Washington D.C.
- Engel, C. (2005). Canada's Exchange Rate: New Evidence, a Simple Model, and Policy Implications. John Kuszczak Memorial Lecture. In *Canada in the Global Economy*, 341–67. Proceedings of a conference held by the Bank of Canada, November 2004. Ottawa: Bank of Canada.
- Fisher, S, Sahay, R &Vegh, C. (2002). Modern Hyper-and High Inflation, *Journal of Economic Literature*, Vol40, pages 837-80
- Fisher, S., Sahay, R.&Vegh, C. (2002).Modern Hyper-and High Inflation, *Journal of Economic Literature*, 40, 837-80.
- Friedman, M. (1956).*The Quantity Theory of Money-A Restatement*. (Ed). Studies in the quantity theory of money, university of Chicago.
- Grier, K. & Mark, J. (2010). The Effects of Real and Nominal Uncertainty on Inflation and Output Growth: Some Garch-m Evidence. *Journal of Applied Econometrics* 15:1, 45–58.
- Gust, C., Leduc, D.&Vigfusson,R. (2010).Trade Integration, Competition, and the Decline in Exchange Rate.*Journal of Monetary Economics* 57: 309-324.

- Hegji, C. (2003). A Note on Transfer Prices and Exchange Rate Pass-through. *Journal of Economics and Finance* 27,3,Fall: 396-403.
- Jensen, C, &Meckling, H. (1976).Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure. In: *Journal of Financial Economics* 3(1976)4.PP 305-360.
- Johnson, H. (1971). The Keynesian Revolution and the Monetarist Counter-Revolution, *American Economic review, papers and proceedings*.
- Kanamori, T. & Zhao, Z. (2006). The Renminbi Exchange Rate Revaluation: Theory, Practice, and Lessons from Japan, *ADB policy papers*; no. 9.
- Karfakis, C. & Kim, S. (1995). Exchange Rates, Interest Rates and Current Account News: Some Evidence from Australia, *Journal of International Money and Finance*, vol. 14, no. 4, pp. 575-595.
- Kiptoo, C. (2007). Real Exchange Rate Volatility, and misalignment in Kenya, 1993-2003, Assessment of its impact on International Trade, and investments, unpublished Ph.D Thesis, University of Nairobi.
- Laryear, S. & Sumaila, U. (2001).Determinants of Inflation in Tanzania, *CMI working paper*.
- Lim, C. & Papi, L. (1997). Econometric Analysis of the Determinants of Inflation in Turkey, International Monetary Fund: WP/97/170, Working Paper.
- Marazzi, M.& Sheets,N. (2007).Declining Exchange Rate Pass-through to U.S. Import Prices: The Potential Role of Global Factors. *Journal of International Money and Finance* 26: 924-947.



- Mbire, B.&Atingi,M. (1997).Growth and Foreign Debt: The Tanzania Experience. AERC Research Paper No. 66. Dares Salam: *African Economic Research Consortium*.
- Miljkovic, D., Brester,D. & Marsh,J. (2003).Exchange Rate Pass-through, Price Discrimination, and US Meat Export Prices.*Applied Economics* 35: 641-650.
- Mishkin, F. (2008).Exchange Rate Pass-through and Monetary Policy.
- Murray, J., van Norden, W.&Vigfusson,R. (1996).*Excess Volatility and Speculative Bubbles in the Canadian Dollar: Real or Imagined?* Bank of Canada Technical Report No. 76.
- Musyoki, D., Pokhariyal G. & Pundo, M. (2012). Real Exchange Rate Volatility in Kenya Journal of Emerging Trends in Economics and Management Sciences (JETEMS) 3 (2): 117-122 © Scholarlink Research Institute Journals. (ISSN: 2141-7024)
- Neiman, B. (2010). Stickiness, Synchronization, and Pass-through in Intra-firm Trade Prices. *Journal of Monetary Economics* 57: 295-308.
- Ngugi, R. &Kabubo J. (1998). Financial Sector Reforms and Interest Rate Liberalization: The Kenya Experience. *AERC Research Paper* 72. Nairobi: African Economic Research Consortium.
- Obstfeld, M., &Rogoff, K. (1995). Exchange Rate Dynamics Redux, *The Journal of Political Economy*, vol. 103, no. 3, pp. 624-660.
- Omojimito, B. and Akpokodje, G. (2010). The impact of exchange rate reforms on trade performances in Nigeria. Journal of social sciences.Vol. 23.No. 1. Retrieved from [www.krepublishers.com](http://www.krepublishers.com)

- Otani, A., Shiratsuka, S.& Shirota T. (2003). The Decline in the Exchange Rate Pass-Through: Evidence from Japanese Import Prices. Bank of Japan Institute for Monetary and Economic Studies (IMES) Discussion Paper No. 2003–E–1.
- Pazos, F. (1972). *Chronic Inflation in Latin America*, New York. Praeger Publishers.
- Reyes, J. (2007). Exchange Rate Pass-through Effects and Inflation Targeting in Emerging Economies: What is the Relationship? *Review of International Economics* 15,3: 538-559.
- Rotich, H., Kathanje, M & Maana, I. (2007). A monetary policy reaction function for Kenya. Paper Presented During the 13th Annual African Econometric Society Conference in Pretoria, South Africa from 9th to 11th July 2008.
- Stancik, J. (2007). Determinants of exchange rate volatility: the case of the new EU members, *Czech journal of economics and finance*, 57, no. 9-10.
- Tegene, A. (1989): The Monetarist Explanation of Inflation; the Experience of Six Africa Countries. *Journal of Economic studies* Vol.16, No5, page5-18
- Vigfusson, N. Sheets, C.& Gagnon J. (2009). Exchange Rate Pass-through to Export Prices: Assessing Cross-Country Evidence. *Review of International Economics* 17,1: 17-33.
- Wambua, J. (2006). The Casual Relationship between Interest Rates & Foreign Exchange Rates in Kenya, *Unpublished MBA Project*, University of Nairobi.

## APPENDICES

### Appendix I: Exchange rates from 2003 to 2013

Year	Exchange Rate (Kshs/USD)
2003	84.15
2004	80.65
2005	75.57
2006	72.15
2007	67.47
2008	69.00
2009	77.34
2010	79.26
2011	88.87
2012	84.52
2013	86.21

Source: Central Bank of Kenya

## Appendix II: Inflation rates from 2003 to 2013

<b>Year</b>	<b>Inflation (%)</b>
<b>2003</b>	9.81
<b>2004</b>	10.74
<b>2005</b>	10.50
<b>2006</b>	14.50
<b>2007</b>	9.80
<b>2008</b>	26.20
<b>2009</b>	10.10
<b>2010</b>	3.88
<b>2011</b>	14.00
<b>2012</b>	9.65
<b>2013</b>	4.75

**Source: Central Bank of Kenya**

### **Appendix III: List of Licensed Commercial Banks in Kenya**

1. African Banking Corporation Ltd.
2. Bank of Africa Kenya Ltd.
3. Bank of Baroda (K) Ltd.
4. Bank of India
5. Barclays Bank of Kenya Ltd.
6. CFC Stanbic Bank Ltd.
7. Chase Bank (K) Ltd.
8. Citibank N.A Kenya
9. Commercial Bank of Africa Ltd.
10. Consolidated Bank of Kenya Ltd.
11. Co-operative Bank of Kenya Ltd.
12. Credit Bank Ltd.
13. Development Bank of Kenya Ltd.
14. Diamond Trust Bank (K) Ltd.
15. Dubai Bank Kenya Ltd.
16. Ecobank Kenya Ltd
17. Equatorial Commercial Bank Ltd.
18. Equity Bank Ltd.
19. Family Bank Ltd
20. Fidelity Commercial Bank Ltd
21. Fina Bank Ltd
22. First community Bank Limited

23. Giro Commercial Bank Ltd.
24. Guardian Bank Ltd
25. Gulf African Bank Limited
26. Habib Bank A.G Zurich
27. Habib Bank Ltd.
28. Imperial Bank Ltd
29. Investment & Mortgage Bank Ltd
30. Jamii Bora Bank Ltd.
31. Kenya Commercial Bank Ltd
32. K-Rep Bank Ltd
33. Middle East Bank (K) Ltd
34. National Bank of Kenya Ltd
35. National Industrial Credit Bank Ltd
36. Oriental Commercial Bank Ltd
37. Paramount Universal Bank Ltd
38. Prime Bank Ltd
39. Southern Credit Banking Corporation Ltd.
40. Standard Chartered Bank (K) Ltd
41. Trans-National Bank Ltd
42. Victoria Commercial Bank Ltd
43. UBA Kenya Bank Ltd.
44. Housing Finance Ltd

**Source: Central Bank of Kenya**