THE EFFECTS OF EXCHANGE RATE VOLATILITY ON THE INFLATION RATE IN KENYA

By

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DECLARATION

This Research project is my original work and has not been submitted for examination in any other University.

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

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DEDICATION

I dedicate this research project to my mother, Mrs. Susan Wairimu Ng'ang'a, for your steadfast encouragement as well as to my brothers and sisters for your generous spirit and support throughout my pedagogical endeavors. May God bless you, and keep you, now and forever.

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To all of you, I can only ask the Lord to continue blessing you in all your endeavors.

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ABBREVIATIONS AND ACRONYMS

AS   - Average Supply

BoP   - Balance of Payment

CBK   - Central Bank of Kenya

CPI   - Consumer Price Index

IMF   - International Monetary Fund

KNBS   - Kenya National Bureau of Statistics

MA   - Monetary Approach

PB   - Portfolio Balance

PPI   - Producer Price Index

PPP   - Purchasing Power Parity

QTM   - Quantity Theory of Money

U.S.   - United States

ABSTRACT

The effect of monetary policy actions affect the general levels of retail prices prevailing in the Country from time to time. Through its monetary policy tools the Government of Kenya is able to control the levels of inflation and moderate negative effects of the exchange rate volatility reported in Kenya. The Central Bank of Kenya (CBK), like most other central banks around the world, was established under Section 231 of the Constitution of Kenya (promulgated on August 27, 2010) to be responsible for formulating monetary policy, promoting price stability, issuing currency and performing other functions conferred on it by an Act of Parliament. It is thus entrusted with the responsibility of formulating and implementing effective policies directed towards achieving and maintaining low inflation rates as one of its two principal objectives; the other being to maintain a sound market-based financial system. Its other secondary objectives include the Formulation and implementation of foreign exchange policy, holding foreign exchange reserves, licensing and supervising authorized dealers, formulation and implementation of such policies as best promote the establishment, regulation and supervision of efficient and effective payment, clearing and settlement systems, act as banker and adviser to, and fiscal agent of the Kenyan government and lastly, to issue currency notes and coin. This study employs correlational research design as well as regression analysis. The study used time series empirical data on the variables to describe and examine the effects of the exchange rate volatility on the rate of inflation in Kenya by establishing correlation coefficients between the inflation and the monetary policy tools, namely, the exchange rates and the T-bill rate prevailing over the entire study period. The study used secondary data on the Consumer Price Index for inflation, 91-day Treasury bill rate, as well as for the exchange rate. The analyses entailed the computation of the various coefficients of correlation denoted as 'β' in the model, the coefficient of determination as well as the Anova test, to determine the effects of the exchange rate volatility on the rate of Inflation in Kenya.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The effects of the policy instruments such as the short-term interest rate, on the goal variables are indirect at best. Monetary policy actions have their most direct and immediate effects on the broader financial markets, including the stock market, government and corporate bond markets, mortgage markets, markets for consumer credit, foreign exchange markets, and many others (Mishkin, 2000). If all works out as planned, the changes in financial asset prices and returns induced by the actions of monetary policymakers lead to the changes in economic behaviour that the policy attempted to achieve. Thus, understanding how monetary policy affects the broader economy necessarily entails understanding both how policy actions affect key financial markets, as well as how changes in asset prices and returns in these markets in turn affect the behaviour of households, firms and other decision makers (Ioannidis and Kontonikas, (2006).

This paper seeks to study how the government of Kenya has managed to keep in check the exchange rate volatility in order to manage the rate of inflation and ensure it is within the desired parameters over the years. The exchange rate volatility refers to the fluctuations within the exchange rate that are experienced between a countrys currency in terms of another countrys currency and the negative or positive effects this has on an economy. Inflation therefore is affected by the rate of exchange rate volatility as a result of increment

or decrement in the value of raw materials or finished products bought from countrys experiencing a strengthening or weakening of the local currency as the case may be.

The paper looks at the Quantity Theory of Money, The Asset Approach Theory, Purchasing Power Parity theorem, Sterilization theorem as well as the Balance of Payment Theorem in detail so as to bring out the theoretical relationship between the two variables. It also seeks to draw to your attention the various cases in which the two variables have interacted so as to bring about both positive and negative effects within the Kenyan context. To do so, it focuses on studies done by several scholars, amongst them Bowa (1994); Kinyua J.K. (2001); Opati, B.J.D. (2009), Taylor J.B. (2001) amongst others.

1.1.1 Inflation Rate

Thirwal (1974) defines inflation as "a rise in the general price level due to increased demand or due to increased import prices or cost push. He adds that there are various mixed causations that may bring about inflation." He identifies five major categories as models of inflation and these include monetarists, pure cost models, hybrid models which contain demand and cost elements, structural models and expectation models. He asserts that it is very difficult to discriminate between these models in analyzing a particular inflation experience as it comes as a result of several forces interacting with one another. It is indeed difficult to isolate one phenomenon and conclude it is the one causing inflation. Inflation is an important economic statistic because it affects the value of money and indicates the overall stability of a country's economy. Inflation is a gradual continuous increase in the price of goods and services. A stable yearly inflation amount is typically between two and

four percent. In Kenya, the Central Bank pegs its optimal inflation rate at 5% + or − 2%. (CBK 2015).

The IMF 2012 report, says that tracking inflation is important for investors, as future income streams must be discounted by inflation to determine what the value of the income is in today's prices. A fixed-income investor would then find that he is losing wealth by investing for any rate that is lower than the inflation rate. For stock market investors, a moderate inflation is motivating to take on the increased risk of investing in stocks, in the hope of generating higher real returns. High rates of inflation increase costs and make a country's exports less competitive in the global marketplace. Fluctuations in inflation, such as a large increase in prices followed by a decrease, can cause decreases in economic growth, reduce spending, decrease investments and increase interest rates. Any inflation over 10 percent per year is potentially problematic for the country's economy.

The International Monetary Fund notes that inflation is calculated using a country's consumer price index (CPI) which measures the average amount of consumers' cost of living expense for the year. Inflation is measured as the percent change in CPI over time, usually one year. Price stability can alternately be measured using gross domestic product (GDP) and core consumer inflation. GDP takes into account all of the goods produced in an economy, not just the consumed goods. Core consumer inflation is measured by excluding prices that are set by the government and those of volatile products, including food and energy that may change frequently. (The Economic Times Magazine August, 2010).

1.1.2 Exchange Rate Volatility

Volatility represents the degree to which a variable changes over time. The larger the magnitude of a variable change, or the more quickly it changes over time, the more volatile it is. Volatility is a statistical measure of the dispersion of returns for a given security or market index. It can either be measured by using the standard deviation or variance between returns from that same security or market index. Normally, the higher the volatility of a particular asset, the riskier is its security.

Civil Society Budget Advocacy Group,(2015) defines the Exchange rate as the price of a nation's currency in terms of another currency. It is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in terms of another currency. An exchange rate thus has two components, the domestic currency and a foreign currency, and can be quoted either directly or indirectly. In a direct quotation, the price of a unit of foreign currency is expressed in terms of the domestic currency. In an indirect quotation, the price of a unit of domestic currency is expressed in terms of the foreign currency.

An exchange rate that does not have the domestic currency as one of the two currency components is known as a cross currency, or cross rate. The term is also known by other names such as currency quotation, the foreign exchange rate or forex rate.

According to Mishkin, (2008), the exchange rate of the currency in which a portfolio holds the bulk of its investments determines that portfolio's real return. A declining exchange rate

obviously decreases the purchasing power of income and capital gains derived from any returns. Moreover, the exchange rate influences other income factors such as interest rates, inflation and even capital gains from domestic securities. While exchange rates are determined by numerous complex factors that often leave even the most experienced economists flummoxed, investors should still have some understanding of how currency values and exchange rates play an important role in the rate of return on their investments.

Exchange rates are prices that are determined by supply and demand. For some countries the exchange rate is the single most important price in the economy because it determines the international balance of payments. (Levich, 2001) There is no general theory of exchange rate determination, but Eiteman et al (2001) divide the potential exchange rate determinants into five areas: parity conditions, infrastructure, speculation, cross-border foreign direct investment and portfolio investment, and political risks.One of the most fundamental issues of the topic in question is the volatility measure. Exchange rate volatility is a measure that is not directly observable thus; there is no clear, right or wrong measure of volatility. Most empirical studies have utilized the standard deviation of the moving average of the logarithm of the exchange rate. The main criticism for such a measure is that it fails to capture the potential effects of high and low peak values of the exchange rate. More specifically, under some economic models these high and low values refer to the unpredictable factor which affects exports.

1.1.3 Exchange Rate Volatility and Inflation Rate

According to Mushtaq Ur RehmanandShafiq Ur Rehman, (2015), inflation is a very vital macroeconomic variable and it has much contribution to the determination of the exchange rate. There is an inverse relation between inflation and exchange rate. An increase in inflation means an increase in the quantity of money in the hands of people or high prices of the products. High product prices imply that the buyers have to spend more than before. This will decrease the demand of the local currency in the FOREX market as buyers' source for the produce in other markets resulting in the devaluation of the currency. The regression analysis between exchange rate and inflation is normally 65.4% which means that inflation is a very strong variable in influencing the exchange rate. The coefficient of determination $R2$ is normally 42.8% which implies that this percent of fluctuation in the exchange rate is caused by inflation.

Although researchers have shown theories to be relevant in terms of explaining systematic patterns of exchange rate behavior, the usefulness of these theories for predicting future exchange rates is limited by the propensity for the unexpected to occur. The real world is characterized by unpredictable shocks or surprises. According to Kiptui (2013), Kenya's inflation rate is driven by domestic developments in the medium to long-term but in the short term other factors come into play and contribute to the inflationary pressure. He asserts that movements in inflation are as a result of price developments abroad and real exchange rate changes. This is best explained by the PPP theorem which introduces assumptions about the behavior of importers and exporters in response to changes in the relative costs of national market baskets. The family of asset-approach models contradicts the aforementioned for

according to it, capital flows freely between nations as there are no significant transaction costs or capital controls to serve as barriers to investment. In such a world, covered interest arbitrage will ensure covered interest rate parity.

1.1.4 Inflation Rate and the Exchange Rate Volatility in the Kenyan Context

Studying the exchange rate pass-through effect to domestic prices in Kenya, Kiptui (2005) shows that there is partial exchange rate pass-through to domestic prices and that therefore importers did not shift forward to domestic consumers the full exchange rate effect on import prices. The exchange rate pass-through is estimated at 20% and 70% in the short-run and in the long-run respectively. The results show that a necessary condition for an operational exchange rate channel holds. As a sufficient condition, and therefore further to the existence of a strong exchange rate pass-through to domestic prices, the elasticity of the exchange rate with respect to a monetary policy shock should be consistent and sufficiently large. The latter aspect was beyond the scope of Kenya. As at the end of July 2015, the Central Bank of Kenya pegged the Kenyan shilling at Khs. 102.52 to the United States Dollar, a far cry from its position on the 2nd of January 2015 where it traded at Khs. 90.70 resulting into a 13.0% devaluation of its currency. Over the same period, the countrys rate of inflation moved from a national average of 6.74% down to 6.54% (CBK, 2015). This is in line with Kiptui (2005) study which shows that despite the increment in the price of commodities being brought into the country, the importers do not shift forward to the domestic consumers the full effects of the exchange rate. If they were to do so, the rate of inflation would have moved up in tandem with the exchange rate but instead, it has gone down in the short run.

In the long run, the reverse occurs. We tend to see the importers passing forward some of the increment in commodity prices onto their customers. On the 2nd of January 2009, the country had an inflation rate of 16.56% and its exchange rate to the US dollar stood at Ksh. 78.27. On the same date in 2015, the country had an inflation rate of 6.74% and was trading at Ksh. 90.70 against the US dollar. This depicts that despite the 15.9% devaluation of the countrys currency, there was an inverse relationship with the inflation rate given the rate of deflation over the same period amounted to 59.3%. This further proves Kiptui (2005) study which shows that in the long term, the importers do indeed pass through the increment in prices to consumers.

1.2 Research Problem

Ronald MacDonald and Mark P. Taylor (1992) have shown that it is difficult to demonstrate that one model of exchange rate determination clearly dominates all others. The effect of inflation is not distributed evenly in the economy, and as a consequence there are hidden costs to some and benefits to others from this decrease in the purchasing power of money.

Increases in inflation erode the real value of money (the functional currency) and other items with an underlying monetary nature. With high inflation, purchasing power is redistributed from those on fixed nominal incomes, such as some pensioners whose pensions are not indexed to the price level, towards those with variable incomes whose earnings may better keep pace with the inflation. This redistribution of purchasing power also occurs between international trading partners. Where fixed exchange rates are imposed, higher inflation in one economy than another will cause the first economy's exports to become more expensive

and affect the balance of trade. There can also be negative impacts to trade from an increased instability in currency exchange prices caused by unpredictable inflation.

Inflation can impose a real cost on society in terms of the efficiency with which the exchange mechanism works and thereby distorting the incentives to save, invest, and work, and by providing incorrect signals that alter production and work effort. Inflation has been seen as the worst tax to the poor by reducing their purchasing power. Because of this, policymakers should be concerned with the on-going rate of inflation and any tendency for it to accelerate. An additional reason for concern arises because efforts to reduce the rate of inflation have often been associated with economic downturns (Kaushik, 2011). High inflation rates being a sign of economic imbalances could reduce economic growth and lead to a reduction of the implementation of sustainable development goals. Moreover, the government aims at maintaining a sustained growth rate of 10% (ADB, 2007) to achieve the vision 2030 and this will be possible only if the inflation levels are kept on check. Macro-economic policies are aimed at having a low inflation rate and stable economic growth rate and inflation plays a major role as an indicator, therefore there is need to keep these rates stable even when they are low.

Some studies have analyzed how monetary policy affects nominal and the real economy (Aron and Muellbauer (2001), Ludi and Ground (2006), Burger and Marinkov (2006)). Their focus was mainly on different channels of the transmission mechanism through which monetary policy affects the economy. Opati (2009) did a study on casual relationship between inflation and exchange rates in Kenya where it was established that an increase in inflation leads to the depreciation of the local currency. However, as per the CBK findings in

the year 2015, outlined above, where we have seen that despite the 13% depreciation in the local currency between January and July, the rate of depreciation actually decreased. From the above illustration, it is clear that there is no clear-cut explanation as to whether fluctuations in a countrys exchange rate lead to an increment in inflation. This depicts that further studies needs to be done on this subject matter. This study therefore sought to answer one question: How effective is the regulation of the countrys exchange rate volatility in countering inflation in Kenya?

1.3 Research Objective

The objective of this study is to determine the effects of exchange rate volatility on the country's inflation rate in Kenya.

1.4 Value of the Study

This study would be of value to different stakeholders including: scholars and academicians, the government through its relevant agency and the policy makers in Kenya. To scholars and academicians, this study would increase body of knowledge on exchange rate volatility and its effects on inflation transmission in the Kenyan Market. It will also suggest areas for further research so that future scholars can pick up these areas and study further. The KNBS would find the findings of this study important in informing their computation of inflation and what commodities to include in their CPI index basket for accurate computation of inflation.

The study would be important to the government especially the Ministry of Finance and the Central Bank of Kenya for making policy decisions whose overall objectives is to influence the level of economic activity and manage the exchange rate volatility. It also would help to facilitate better monetary policy transmission and stable prices that support economic growth in the country.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter looks at the literature on the effects of exchange rate volatility on the rate of inflation in Kenya. It reviews studies by other scholars especially studies touching on the volatility of the exchange rate inflation precursors. The chapter addresses the theoretical framework on which the study will be built, measurement of inflation rates, empirical literature and chapter summary.

2.2 Theoretical Review

Thirwal (1974) defines inflation as a rise in the general price level due to increased demand or due to increased import prices or cost push. He adds that there are various mixed causations that may bring about inflation. He identifies five major categories as models of inflation and these include monetarists, pure cost models, hybrid models which contain demand and cost elements, structural models and expectation models. He asserts that it is very difficult to discriminate between these models in analyzing a particular inflation experience as it becomes as a result of several forces interacting with one another. It is indeed difficult to isolate one phenomenon and conclude it is the one causing inflation.

2.2.1 Quantity Theory of Money

"The fact that the demand for real balances is stable seems to be general whether the economy is developed or underdeveloped." Joseph O. Adenkule (n.d.). The quantity theory of money is one of the oldest surviving economic doctrines having been discovered by Pole

Nicholas Copernicus who lived in the years 1473–1543. It asserts that changes in the level of general prices (inflation) are determined primarily by changes in the quantity of money in circulation. The quantity theory of money formed the central core of 19th century classical monetary analysis. It provided the dominant conceptual framework for interpreting contemporary financial events and formed the intellectual foundation of orthodox policy prescription designed to preserve the gold standard. The theory on monetarism was brought forward by Friedman (1982) and in his theory he looks at the quantity theory of money and linked spending to the total amount of money in the economy. His theory asserts that inflation was as a result of an increase in the supply of money in the economy. He concludes that inflation occurs if the growth of money supply in the economy supersedes the economic growth.

Hume (1711-76) provided the first dynamic process from one sector of the economy to another, altering relative price and quantity in the process. He provided considerable refinement, elaboration and extension to the quantity theory of money. Ricardo (1772-1823), the most influential of the classical economists, thought such disequilibrium effects as ephemeral and unimportant in long-run equilibrium analysis. As leader of the Balloonists, Ricardo charged that inflation in Britain was solely the result of the Bank of England's irresponsible over issue of money. In 1797, under the stress of the Napoleonic Wars; Britain left the gold standard for an inconvertible paper standard. Ricardo discouraged discussions on possible beneficial output and employment effects of monetary injection.

The theory explains demand pull inflation as being caused by excess demand for goods and services which causes a positive output gap, whereby businesses respond by raising prices to increase their profit margin. This is attributed to increases in the money supply in the economy, depreciation of the exchange rate and reduction in the tax rates in an economy. Monetarism maintains the view that inflation is as a result of higher rate of growth of money supply from the rate of growth in the economy, aimed at regulating the quantity, cost and allocation of money and credit in the whole economy. Moreover it aims at achieving a set of objectives to maintain growth and stability in the economy. Therefore any monetary policy seeks to stabilize both the exchange rates and prices, raise the level of employment, stable economic growth and interest rate smoothing.

Fisher (1947) spelled out his famous equation of exchange viz. MV=PT. This and other equations, such as the Cambridge cash balance equation, which corresponds with the emerging use of mathematics in neo-economic analysis, define precisely the conditions under which the proportional postulate is valid. Fisher and other neo-classical economists, such as Arthur Cecil Pigou (1877-1959) of Cambridge, demonstrated that monetary control could be achieved in a fractional reserve-banking regime via control of an exogenously determined stock of high power money.

Calvo Guillermo and Carlos H. Vegh (June 2012), note that if balance-of-trade deficits are financed by depleting domestic stocks of foreign currency, and trade surpluses are associated with increases in domestic holdings of foreign money, we the experience the role for the trade account. If the exchange rate adjusts so that the stocks of domestic and foreign money

are willingly held, then the country with a trade surplus will be accumulating foreign currency. As holdings of foreign money increase relative to domestic money, the relative value of foreign money will fall, or the foreign currency will depreciate.

2.2.2 The Asset Approach Theory

According to Jacob Frenkel, (May 1976), modern exchange rate models emphasize financial-asset markets. Rather than the traditional view of exchange rates adjusting to equilibrate international trade in goods, the exchange rate is viewed as adjusting to equilibrate international trade in financial assets. Exchange rate models emphasizing financial-asset markets typically assume perfect capital mobility. In other words, capital flows freely between nations as there are no significant transaction costs or capital controls to serve as barriers to investment. In such a world, covered interest arbitrage will ensure covered interest rate parity.

Within the family of asset-approach models, there are two basic groups: the monetary approach and the portfolio-balance approach. In the monetary approach the exchange rate for any two currencies is determined by relative money demand and money supply between the two countries. Relative supplies of domestic and foreign bonds are unimportant. The portfolio-balance approach allows relative bond supplies and demands as well as relative money-market conditions to determine the exchange rate. (Michael Mussa, May 1976).

In their book, Hanna Halttunen and Paul Masson (1977) point out that the essential difference is that monetary-approach (MA) models assume domestic and foreign bonds to be perfect substitutes, whereas portfolio-balance (PB) models assume imperfect substitutability.

If domestic and foreign bonds are perfect substitutes, then demanders are indifferent toward the currency of denomination of the bond as long as the expected return is the same. In this case, bond holders do not require a premium to hold foreign bonds—they would just as soon hold foreign bonds as domestic ones—so there is no risk premium, and uncovered interest rate parity holds in MA models. With imperfect substitutability, demanders have preferences for distributing their portfolio over the assets of different countries. That is, asset holders have a desired portfolio share for any particular country's assets due to the portfolio diversification incentives. If the supply of one country's assets increases, they will hold a greater proportion of that country's assets only if they are compensated. This requires a premium to be paid on these assets.

In general, then, PB models have risk premiums in the forward exchange rate that are a function of relative asset supplies. As the supply of country A's financial assets rises relative to B's, there will be a higher premium paid on A's assets. An implication of this premium is that uncovered interest rate parity will not hold because risk premiums will exist in the forward market. This premium is missing in the MA model because there, it is assumed that investors don't care whether they hold country A or country B bonds or in what mix they are held. (PenttiKouri and Jorge de Macedo, 1978)

In recent years, an important topic of debate has emerged from the literature on the monetary approach regarding the ability of central banks to sterilize reserve flows. According to Kenneth Rogoff, (September 1984), sterilization refers to central banks offsetting international reserve flows to follow an independent monetary policy. Under the monetary

approach to the balance of payments (with fixed exchange rates), if a country had an excess supply of money, this country would tend to lose international reserves or run a deficit until money supply equals money demand. If, for some reason, the central bank desires this higher money supply and reacts to the deficit by further increasing the money supply, then the deficit will increase and persist as long as the central bank tries to maintain a money supply in excess of money demand. For an excess demand for money, the process is reversed. The excess demand results in reserve inflows to equate money supply to money demand. If the central bank tries to decrease the money supply so that the excess demand still exists, its efforts will be thwarted by reserve inflows persisting as long as the central bank tries to maintain the policy of a money supply less than money demand. The discussion so far relates to the standard monetary-approach theory with no sterilization. Evidence of this is presented by Michael Connolly and Dean Taylor. (August 1979)

Geert Almekinder and Edward Elgar (1995), assert that it is reasonable to interpret the evidence regarding sterilization as indicating that central banks are able to sterilize a significant fraction of reserve flows in the short run. This means that the monetary authorities are likely to choose the growth rate of the money supply in the short run, although long-run money growth must be consistent with money-demand requirements. The portfolio-balance model permits sterilized intervention to alter the exchange rate, even though money supplies are ultimately unchanged. In the monetary approach, the relative bond supplies are deleted. The only way that a sterilized intervention could change the exchange rate would be if money demand changed so that income or prices (or perhaps the interest rate, if we added that as a determinant of money demand) changed as well.

2.2.3 Purchasing Power Parity (PPP) Theory

According to Stephen M. Suranovic, the PPP relationship becomes a theory of exchange rate determination by introducing assumptions about the behavior of importers and exporters in response to changes in the relative costs of national market baskets. When the price of a good differs between two country's markets, there is an incentive for profit-seeking individuals to buy the good in the low price market and resell it in the high price market. Similarly, if a market basket, containing many different goods and services, costs more in one market than another, we should likewise expect profit-seeking individuals to buy the relatively cheaper goods in the low cost market and resell them in the higher priced market. If the law of one price leads to the equalization of the prices of a good between two markets, then it seems reasonable to conclude that PPP, describing the equality of market baskets across countries, should also hold. However, adjustment within the PPP theory occurs with a twist compared to adjustment in the law of one price story. The twist that's included in the PPP theory is that arbitrage, occurring across a range of goods and services in the market basket, will affect the exchange rate rather than the market prices.

More specifically, as stated by Lumby S. & Jones C. (1999), the currency of the country with the higher rate of inflation will depreciate against the other country's currency by approximately the inflation deferential. In conclusion, it can be argued that the theory, although it describes in a sufficient way the determination of the exchange rates, is not of good value, mainly because of the following two disadvantages. Firstly, not all goods are traded internationally (for example, buildings) and secondly, the transportation cost should represent a small amount of the good's worth.

2.3 Determinants of Inflation

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. Those countries with higher inflation typically see depreciation in their currency in relation to the currencies of their trading partners. This is also usually accompanied by higher interest rates.

Gottschalk et al (2008) in their paper on analyzing determinants of inflation when there are data limitations in the case of Sierra Leone, they use the structural vector auto regression approach to help forecast inflation and find out that domestic inflation increases with higher oil prices, higher money supply and leads to nominal wage depreciation. The purchasing power of the poor may shrink if commodities rise and makes it harder for the poor who may be surviving on a limited budget. This would be due to the fact that their incomes do not increase in the same rate as prices increase.

In analyzing inflation in Uganda, Kabundi (2012) uses the error correction model to analyze the dynamics of inflation and found out that in the short run and long run external and domestic factors contribute to inflation causation with the agricultural sector being affected by the demand and supply of it commodities.

2.3.1 Differentials in the Exchange Rate

A change in the exchange rate can result into imported inflation. The price of imported goods will go up because they are more expensive to buy from abroad. This is most likely to occur in periods where a country's currency is greatly devalued. A primary effect occurs when

residents of a country consume more export goods (domestically produced) than import goods. It links the domestic inflation to balance of payments. This depends on the importance of the foreign sector in the economy and the marginal propensity to import. A secondary effect occurs when excess spending on domestic goods increases the price of those goods, relative to the price of foreign goods. The increase in the price of domestic goods will induce a further rise in imports (as they are cheaper), which is higher the elasticity of substitution of import goods for home goods. In addition, exports may decrease. Manufacturers who export see an improvement in competitiveness without making any effort. Some argue this may reduce their incentive to cut costs, and therefore, we get higher inflation over the long term. Cost – push inflation has a similar effect on the balance of payments i.e. the secondary effect. (Michael Mussa, (May 1976).

Sowa &Kwakye (1993) explained that inflation in Ghana could be explained more by the monetary factors and formulated a model showing the sources of inflation as monetary factors, real factors and expectations i.e. P=f (M,Y,E,Pe). Inflation is seen as dependent on both the growth of money and output and rate of exchange that is the domestic price of foreign currency and price expectations. They found out that monetary pressure was a strong force in Ghana's inflation and exchange rate devaluations have an effect on inflation but supply factors constituted a much stronger inflationary force than monetary factors but exchange rate adjustments did not show a strong influence on inflation therefore a multifaceted issue with many causes.

2.3.2 Differentials in Interest Rates

Interest rates, inflation and exchange rates are all highly correlated. By manipulating interest rates, central banks exert influence over both inflation and exchange rates, and changing interest rates impact inflation and currency values. 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. According to the Mundell-Flemming model, higher interest differential would attract capital inflows and result in exchange rate appreciation. On the other hand, monetarists believe that higher interest rate reduces the demand for money which leads to depreciation of currency due to high inflation. But the spot exchange rate might be affected positively by the high interest rate policy when the expected exchange rate becomes an increasing function of the domestic interest rates.

According to Sargent and Wallace (1981) a high interest rate policy may lead to a reduction in demand for money and increase in price level because an increase in interest rate implies an increase in government debt which, in turn, would be financed by seinorage. As a result there will be exchange rate depreciation. Similarly an increase in interest rate may adversely affect the future export performance which would reduce the future flow of foreign exchange reserves and thereby, leads to depreciation of currency (Furman and Stiglitz, 1998).Furman and Stiglitz(1998) have examined the effect of an increase in interest rate, inflation, and many non-monetary factors on exchange rate for developing countries during 1992-98. They found that the high interest rate was associated with a subsequent depreciation of nominal exchange rate but the effect was more pronounced in low inflation country than in high inflation country.

2.3.3 Trade Balances –Foreign Direct Investment (FDI) –Portfolio Investment

Much currency trading is used to finance cross-border portfolio investment, for example investors putting their funds into stocks and shares, government bonds and property. Strong inflows of portfolio investment from overseas can cause a currency to appreciate. Gould and Kamin (2000) examined the interest rate and exchange rate relationship by studying the effect of interest rate, risk premium, and default probabilities on the exchange rates for Indonesia, South Korea, Malaysia, the Philippines, Thailand, and Mexico. They found that the exchange rates in these countries were influenced by credit spreads and stock prices rather than interest rates. According them, their results neither support Mundell-Fleming's view nor monetarist's views.

2.3.4 Government or Public Debt

Countries will engage in large-scale deficit financing to pay for public sector projects and governmental funding. While such activity stimulates the domestic economy, nations with large public deficits and debts are less attractive to foreign investors. A large debt encourages inflation, and if inflation is high, the debt will be serviced and ultimately paid off with cheaper real dollars in the future. In the worst case scenario, a government may print money to pay part of a large debt, but increasing the money supply inevitably causes inflation. Moreover, if a government is not able to service its deficit through domestic means (selling domestic bonds, increasing the money supply), then it must increase the supply of securities for sale to foreigners, thereby lowering their prices. Finally, a large debt may prove worrisome to foreigners if they believe the country risks defaulting on its obligations. Foreigners will be less willing to own securities denominated in that currency if the risk of

default is great. For this reason, the country's debt rating (as determined by Moody's or Standard & Poor's) is a crucial determinant of its exchange rate.

Bernanke & Mishkin (1997) in their paper observes that inflation targeting involves the announcement of an official target ranges for the inflation rate and therefore conclude that monetary policy aims at having a low and stable inflation. They observe that it involves the announcement by the governments' central bank that in the future it will strive to hold inflation at some numerically specified level. They are often in ranges rather than single numbers and cover a period of years and their view on inflation targeting offers transparency of policy by making their intentions known to the public and moreover increasing central banks accountability and coherent policy making. Romer & Chow (1996) found out that a prudent monetary policy which aims at low inflation and steady growth, may lead to an improved life for the poor in the long run and reduce the value of the cash holdings and therefore making the poor more poorer.

2.3.5 Political Stability and Economic Performance

Foreign investors inevitably seek out stable countries with strong economic performance in which to invest their capital. A country with such positive attributes will draw investment funds away from other countries perceived to have more political and economic risk. A recession may cause depreciation in the exchange rate because during a recession interest rates usually fall. Some researchers have studied the nexus between the interest rate and exchange rate in a broader international crisis. In this context, Goldfajn and Gupta (1999) have examined 80 currency crisis episodes between 1980 and 1998. By using fixed effect

panel regression, they conclude that an increase in interest rate is associated with an appreciation of nominal exchange rates. They also found that the probability of choosing a high interest rate policy during the post-crisis period was low if the country was faced with a banking crisis.

While analyzing the effect of political stability on inflation, Aisen & Veiga (1999) asserts that inflation leads to the reduction of the welfare of people in the society and economic growth and found out that political instability can lead to higher inflation levels especially in developing nations. Moreover political instability has an effect on the efficiency of the tax system and hence government revenues used due to tax evasion and people holding the government responsible for economic outcomes and a rising demand for public expenditure which may end up being financed by inflation tax however he adds that inflation control measures should be undertaken together with other policies. Bernanke & Reinhart (2004) is of the view that the consumer price index portrays the increase in price for poor households and is mostly confined on food, fuel, medicine, and some essential commodities .This would therefore mean inflation for the poor is the increase in price of the most essential commodities.

2.3.6 Speculation

If speculators believe the sterling will rise in the future, they will demand more now to be able to make a profit. This increase in demand will cause the value to rise. Therefore movements in the exchange rate do not always reflect economic fundamentals, but are often driven by the sentiments of the financial markets. For example, if markets see news which

makes an interest rate increase more likely, the value of the pound will probably rise in anticipation. Kraay (1998) has examined whether an increase in interest rate policy can defend the speculative attack by using monthly data for 75 developed and developing countries over the period 1960-99 and found that the high interest rates policy don't defend the currencies against speculative attacks. Therefore, he concludes that there is a striking lack of any systematic association between interest rates and the outcome of speculative attack.

According to Michael Melvin (1985), one of the main reasons expectations are important is because people take account of them in their wage claims. If inflation is expected then people will include that in their claim to ensure that they get a real wage increase. This increases firms' costs and so can in itself cause inflation. If people believe that increases in the money supply will simply cause inflation, then any increase will simply lead to inflation and no real increase in output or employment. This is because they will simply anticipate the effects. This is essentially the monetarist position on expectations. The most extreme version of this is rational expectations. The rational expectations school assumes that people will look simply at the present situation and take no account of the past. This means that they will instantly anticipate the impact of any changes. The government therefore have no chance at all of getting away with subtle changes to try to boost demand, as people will simply anticipate the inflationary impact, and the changes will be useless.

2.4 Empirical Review

Chhibber (1991) after analyzing the economies of some African countries concludes that inflation is caused by four main factors; cost push factors emanating from currency

devaluations, demand pull forces created by excessive credit expansion in the economy, balance of payment problems and controlled prices that deviate from the prevailing market prices and the readjustment of these prices cause inflationary shocks.

Mohanty and Klau (2003) concluded that, out of 13 leading emerging economies in their study, only two had not adopted inflation targeting (IT), a related type of rule-based policy. Since inflation targeting leads to a more systematic response by the central bank to inflation, the interest rate setting process in these economies had been guided by such a rule-like policy. The main conclusion of their study is that, in emerging economies, central banks, most of the time, change short-term interest rate in response to deviations in inflation and exchange rate movements. They also note that although price stabilization remains a main objective of central banks in emerging countries, other objectives such as output stabilization, stability of the exchange rate and in few cases, stability of asset prices and current account deficit have been highlighted as central bank objectives.

Sowa and Kwakye (1993) concluded that inflation in Ghana could be explained more by the monetary factors and formulated a model showing the sources of inflation as monetary factors, real factors and expectations i.e. P=f (M,Y,E,Pe). Inflation was seen as dependent on both the growth of money and output and rate of exchange that is the domestic price of foreign currency and price expectations. They found out that monetary pressure was a strong force in Ghana' inflation and exchange rate devaluations have an effect on inflation but supply factors constituted a much stronger inflationary force than monetary factors but

exchange rate adjustments did not show a strong influence on inflation therefore a multifaceted issue with many causes.

Bowa (1994) concluded that the inflationary process in Zambia was attributed to monetarist and structuralist schools of thought and changes in money supply and exchange rate adjustments were found to be significant determinants of inflation. Tightening of monetary and fiscal policies was essential to reduce money supply changes. His findings revealed that an increase in money supply led to a 1 per cent rise in the rate of inflation within two years.

Adam (2009) studied the conduct of monetary policy in Uganda using an assessment. The study discussed aspects of the conduct of monetary policy in Uganda with the starting point being the perception held by some that while Uganda had been amongst the most consistently successful countries in Africa in controlling inflation since the early 1990s, this had come at a high fiscal cost and that the conduct of monetary policy had stifled rather than encouraged the development of the financial sector.

Still focusing on Uganda, (Elbadawi's, 1990) research revealed that rapid monetary expansion and the precipitous depreciation of the parallel exchange rate were the principal determinants of inflation during 1988-89. He concluded from the comprehensive review of exchange rate and price movements that devaluation of the official exchange rate is not inflationary. Obviously, this conclusion is consistent with the findings of (Chhibber and Shafik, 1990) and (Sowa and Kwakye 1991) with respect to Ghana.

Chhibber (1991) posits that there is no one and-only-one relationship between exchange rate and price inflation. Basing his argument on empirical studies of some African countries, one of his main conclusions is that devaluation could exert upward pressure on the general price level through its increased cost of production in the short-run. For Chhibber, the extent to which devaluation of a local currency engenders inflation is largely a function of the impact of such policy measures on the revenues and expenditures (budget) of government, together with the monetary policy that is simultaneously pursued

Ndungu (1996) in his paper on inflation in Kenya concluded that inflation emanates from cost push factors, due to currency devaluation, demand pull forces where excessive credit expansion causes excess demand, balance of payments crisis and controlled prices which deviate from market prices causing shocks. He observed that the monetary base, exchange rate, real income growth and interest rate have an effect on the rate of inflation in a country and concludes that exchange rate is more important than monetary factors in explaining the inflationary process in Kenya and that inflation and money supply leads to the depreciation of the nominal exchange rates.

Rotich, Kathanje and Maana (2007) did a study on monetary policy reaction function for Kenya. Their study reviewed the then conduct of monetary policy and the Central Bank rule-based behaviour in Kenya. Using both backward and forward-looking policy rules with appropriate modification to take into account the characteristics in developing countries, they tested whether the Central Bank of Kenya (CBK) reacted to changes in inflation, GDP growth and the exchange rate in a consistent and predictable fashion. Their results indicate

that during the period after liberalization (1997-2006), CBK had used monetary aggregates as a main policy instrument in conducting monetary policy. The estimate of the coefficient on the inflation gap implied that a rise in expected annual inflation of one percent induced the CBK to lower the expansion of broad money (M3) by 4.2 percent. Similarly, the coefficient of inflation with respect to the repo rate was 2.4 which was consistent with Taylor's non-accommodative policy. The results indicated that CBK followed a rule to target inflation with some allowance for output stabilization. We also found a statistically significant reaction to exchange rate, perhaps explaining the relative stability of exchange rate during the greater part of the sample period.

Mburu (2002) argues that the inflationary pressure in Kenya in the decade of 1970''s was mainly supply side due to changes in external prices, he also observes that in the 1980''s there was excessive deficit financing which resulted to seigniorage and in the 90''s there was excess liquidity leading to rise in prices due to monetary expansion in the economy. He explains the inflation trend and concludes that inflation targeting has succeeded in bringing inflation rates down in Kenya; however he adds that inflation control measures should be undertaken together with other policies.

According to Kiptui (2013) Kenya's inflation rate is driven by domestic developments in the medium to long-term but in the short term other factors come into play and contribute to the inflationary pressure. He asserts that movements in inflation are as a result of price developments abroad and real exchange rate changes. He uses the p-star model to explain the

effect of policy change in a timely manner making it possible to achieve price stability and consistency between monetary policy decisions and the macro environment.

2.5 Summary of Literature Review

The chapter has summarized both the theoretical as well as the empirical assumptions in details and found that an interaction of forces has been found to cause inflation, with a number of factors such as exchange rates, money supply, wages, food and oil prices leading to a rise in the general price level.

As far as macroeconomics and the conduct of monetary policy in an economy are concerned there are areas where there is disagreement, as well as puzzles about how the economy functions and how monetary policymakers should seek to achieve their ends. The monetary approach is seen to be unrealistic in its assumption that both domestic and foreign bonds are perfect substitutes while we all can attest the fact that this is untrue. We also find that the law of one price would not hold in cases of imperfect markets where information on readily available opportunities is not widely spread or distributed in a timely manner. The PPP theorem also faces conflict where the items for sale feature an item that cannot be valued in monetary terms. In such a situation, the item tends to sell for different amounts nullifying the one price argument. The same also holds true when disputing the PPP theorem in that it assumes that the goods and services procured form one country do not have transportation and trade restrictions. Since transportation and import tariffs exist, they tend to drive the prices of similar goods apart.

While a relatively large number of central banks around the world have adopted a formal inflation target (sterilization), it is by no means universal. One of the charges sometimes imposed against having an inflation target is that it pays insufficient attention to economic objectives other than inflation. In order to address the issue of the exchange rate volatility relevance to the problem of inflation, there is need for an appropriate framework that serves as a reference point in order for us to understand the underlying interrelationships between exchange rate volatility and inflation in an economy like Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the procedures and methodologies that were undertaken in conducting the study to arrive at conclusions regarding the relationship between exchange rate volatility and inflation rates in Kenya. Specifically, the chapter covers: research design, data collection method, data analysis and model specification.

3.2 Research Design

The study employed correlational research design. The study used time series empirical data on the variables to describe and examine the effects of the exchange rate volatility on the inflation rate in Kenya by establishing correlation coefficients between inflation and the exchange rate tools.

3.3 Data Collection

The study used secondary data on the Consumer Price Index for inflation, 91-day Treasury bill rate and exchange rate. The data on inflation (CPI) was obtained from KNBS while data on 91-day Treasury bill rate and the exchange rate was obtained from the CBK. For the exchange rate, the study focused on the US dollar rate since it was the most commonly used currency to settle international transactions. The data utilized was public data as it was published in the websites of the relevant government agencies including CBK and KNBS.

The period of study for which data was obtained focused on a nine year period between 2006 and 2014. The study made use of monthly data.

3.4 Data Analysis

The study employed computer software SPSS version 20 to analyze the data. Given that the study model was a multivariate one, the study used a multiple regression technique in analyzing the relationship between the inflation and the exchange rate volatility.

The analyses entailed the computation of the various coefficients of correlation denoted as 'β' in the model to determine the effectiveness of exchange rate volatility regulation in countering inflation in Kenya.

3.5 Model Specification

The variables of the study comprised of the Consumer Price (CPI) index as the dependent variable and the 91-day Treasury bill and the exchange rate as the independent variables. The regression model was a multivariate model stating the CPI index as a function of the stated monetary policy tools as follows:

As such, the regression equation appeared as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

CPI $= \beta_0 + \beta_1 91\text{-}T\text{-}billrate + \beta_2 exchange\ rate + error\ term.$

To simplify, we let:

Y = Monthly Consumer Price Index

X_1 = Monthly 91-day Treasury bill rate

X_2 = Standard Deviation of the Monthly exchange rate (US dollar)

ε = Monthly error term

Consumer Price Index (CPI) represented the rate of inflation existing in Kenya for the period under study. The percentage change in CPI measured inflation. To compile the Consumer Price Index, a predetermined set of goods, forming a typical basket of goods bought by an average urban consumer, was selected. All the items were weighted according to the percentage of income that households spend per category. An average of the change in the prices of these items was calculated on a monthly basis. The study adopted CPI figures already computed by the KNBS for the period 2006-2014.

The 91-day Treasury bill rate was measured by applying the average monthly 91-day Treasury bill rate at which the government borrowed from the public. The exchange rate was measured by taking the average applicable exchange figures for the United States Dollar because it was the most used common currency.

The error term stood for the effect of other factors other than the exchange rate and the t-bill rate on the CPI and helping to stabilize the model. The data on the above variables was collected from secondary data contained in Central Bank reports. The study tested at 95% confidence level and 5% significant levels. If the significance number found was less than the critical value (set at 0.05), then the conclusion was that the independent variables were relevant in explaining the relationship with the dependent variable. Else the independent variables were regarded as non significant in explaining the changes in the dependent variable.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the analysis, results and findings of the study as set out in the research objective and research methodology above. The study findings are presented on the effects the exchange rate volatility on the rate of inflation in Kenya. The data was collected exclusively from secondary sources which included the online records at the Central Bank of Kenya (CBK) and the Kenya National Bureau of Statistics (KNBS).

4.2. Consumer Price Index

The study collected data on the prevailing Consumer Price Index (CPI) for the study period 2006-2014 on a monthly basis.

In 2006, the consumer price index oscillated4.16 in July and 9.39 in February. During that year, the CPI opened at 8.39, escalated to 9.39 then went on a downward decline over the course of five months to rest at 4.16 before increasing to a close of 7.98 in December. In 2007, the index opened at 4.63 which went down to 1.96 by May then bounced back to 4.07 in July to 4.07 before rallying to 6.08 in November and resting at 5.70 in December. In 2008, the index opened at 9.4 and experienced double digit growth throughout the year to climax at 19.54 in November then eased to 17.83 in December. In 2009, the index began at a high of 13.22 before going on a gradual reduction throughout the year to record a low of 5 in November and close at 5.32. 2010 saw the downward trend continue with the figures

averaging 3.5 points before climbing marginally to 4.51 at the close of the period. A shift towards the increase in points was experienced in 2011 where the index jumped back to its record high figures with the lowest points being recorded in January at 5.42 and the highest being arrived at in November at 19.72 which was more that thrice the figure obtained at the beginning of the year. The year closed on a high of 18.93, just 0.79 points shy of the period's peak. The high index continued into the first half of 2012 though a gradual decline in the points persisted. There was however a sharp break in the rates in July by over 2.31 points returning the index to single digit figures, from a high of 18.31 in January to an all time low of 3.2 in December. The all time low figures dominated the first half of 2013 with a low of 3.67 being experienced in January. A gradual increment in points saw the figures more than double to a periodic high of 8.29 in September before easing marginally to close the year at 7.15 in December. In 2014, relatively stable points were witnessed with mild fluctuations being experienced of between 8.63 in August and 6.02 in December. The period opened at 7.21 points and closed at 6.02 with relatively mild and gradual variations being felt. These findings are well illustrated in the figure 4.1 below.

**Figure 4.1: Consumer Price Index (2006-2014)**
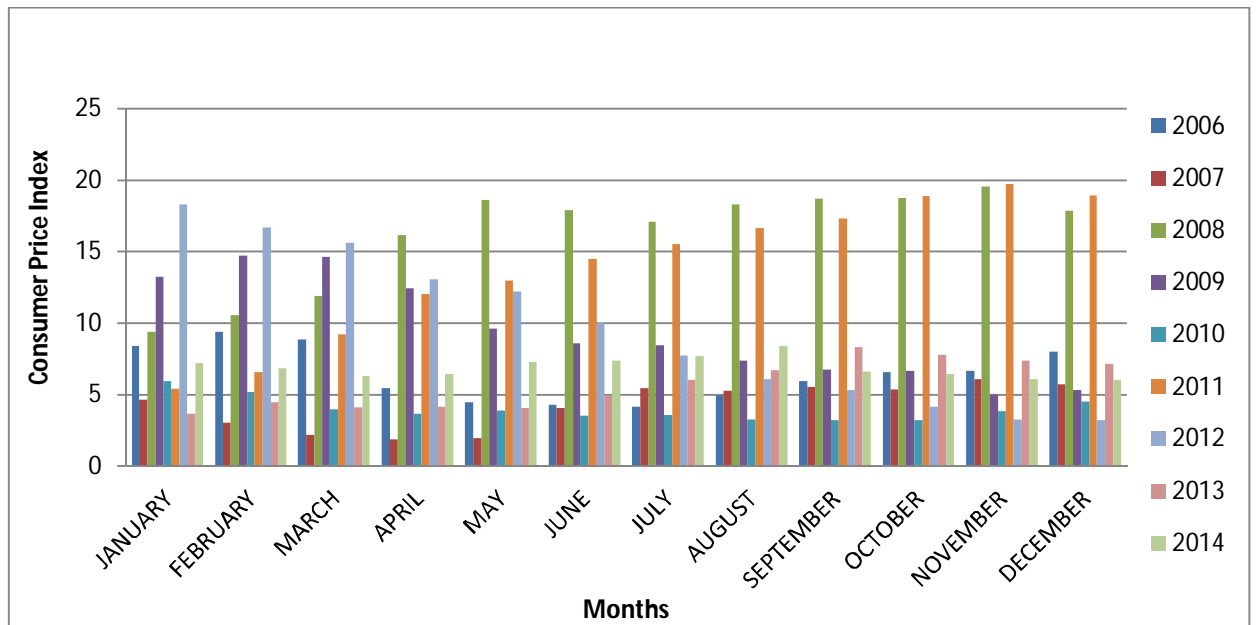
4.3 91-Day Treasury Bill Rates

The study collected and later analyzed data on the prevailing rates of the 91 day Treasury bills from the Central Bank and the Kenya National Bureau of Statistics (KNBS) websites for the study period. In January 2006, the rate stood at 8.23% and experienced a slight change during the year to a median of 6.71%. This further declined to its lowest level to close the year at 5.93% over the base year's exchange rate figure. In 2007, there were minimal changes in the rate with the rate averaging 6.80%. The highest rate was observed in October at 7.55% with the lowest in January at 6.00%.6.86% was the closing figure in December for that year. 2008 saw a gradual increment in the rates with the figures experiencing a consistent increment from a low of 6.99% in January to a high of 8.59 in December. This figure helped usher in 2009 with the periods high of 8.47%, a rate which experienced a downward slide

month after month during the year to close at 6.82%, the periods lowest. January 2010 began with a high of 6.56% a rate that progressed downwards during the entire period.

A sharp break was never the less experienced in June of the same year when figures dropped marginally by half to 2.98% and later dropped to an all time low of 1.60% in July, barely a month later. The rock bottom rate then began a gradual upward climb to rest at 2.28% in December.2011 was ushered in with ultra low levels with the period opening at 2.44% which then experienced an eight fold increment to lose the year at a high of 17.78%. This trend of extra-ordinarily high rates continued and peaked at the beginning of January 2012 where an all-time high of 20.56% was experienced. The rest of the year saw a gradual return to normalcy where the rat began a slow decline in rates till September when the rates dropped to single digit rates to 7.7%, only to close at 8.25% in December. 2013 saw near-normal rates continue their dominance with a high of 10.38% seen in April and a low of 8.10% experienced in January. The final year of our study saw relatively small changes with the rates nearly constant and with the few changes tending towards negligible levels. Nevertheless, the year recorded a high of 9.78 in July and a low of 8.29% in August. The year had opened at 9.26% and closed at 8.50%.These details are well illustrated in the figure 4.2 below.

Figure 4.2: The T-Bill Rate
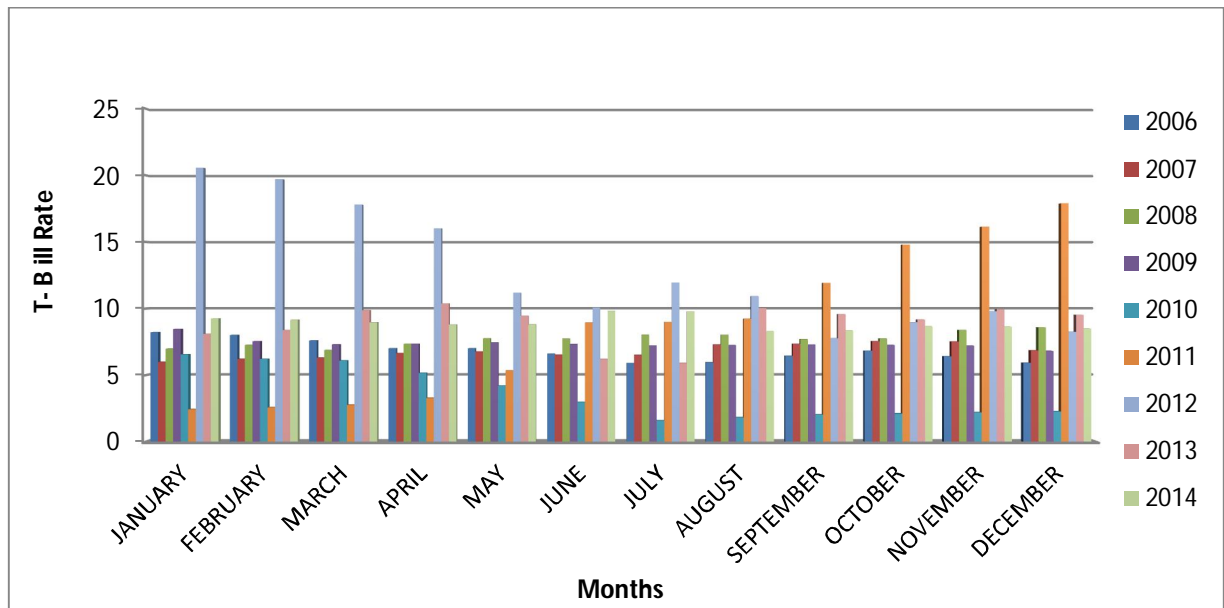
4.4 **Exchange Rate (USD)**

The study collected data on the recorded average exchange rates against the United States Dollar because it was the major currency in which many transactions were undertaken. The year 2006, which marked the commencement of our study period, began with an exchange rate of 71.98 shillings against the USD. This then experienced a gradual increment to a high of 73.88 in June before easing to a close of 69.39 at the end of the period. January 2007 saw the highest rate during the year at 70.54 which then experienced a creeping strengthening of the shilling to close at 62.54 against the USD. 2008 was a period of mixed fortunes as the shilling opened at 70.56 only to strengthen to 62.03 in May before experiencing a decline in value to close at a low of 77.71 against the dollar. The devaluation continued into the year 2009 which opened at 79.54 which rallied to 80.43 by March of the same year before the shilling strengthened to a high of 74.91 in November then closing the period a month later at 75.69. 2010 marked the period when the shilling passed the mark of 81 shilling to the dollar

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after the year began at a high of 75.89 and due to pressure, was devalued consistently during the year to an all time low of 81.92 in June. It then struggled to obtain a footing to close the year at the rate of 80.75.A 4.7% decline n the value of the shilling was experienced in the year 2011 where the shilling was exchanged at the rate of 81.27 in January only to be devalued steadily to a low of 99.83in September and experience a minimal redemption in value to close the year at a partly 85.07. The devaluation rally continued into 2012 with the year beginning at 86.34 against the dollar, a rate which experienced small redemption to a high of 82.89 in March only to decline to the year's low of 85.99 against the dollar in December 2012.

The shilling continued to be under downward pressure against the dollar in the following year this opened at 86.90 strengthening briefly to a high of 84.14 in May before increasing to a low of 87.49 in August and later tailing off the year at 86.31. The final year of our study, the year 2014, saw the shilling open at a high of 86.21 only for it to plummet relentlessly throughout the year to a low of 90.44 against the United States Dollar, a figure which marked new lows for the Kenyan currency as well as ushered in its lowest ever level since independence. These findings are well illustrated in the figure 4.3 below.

Figure 4.3: Exchange Rate against the USD Graph.
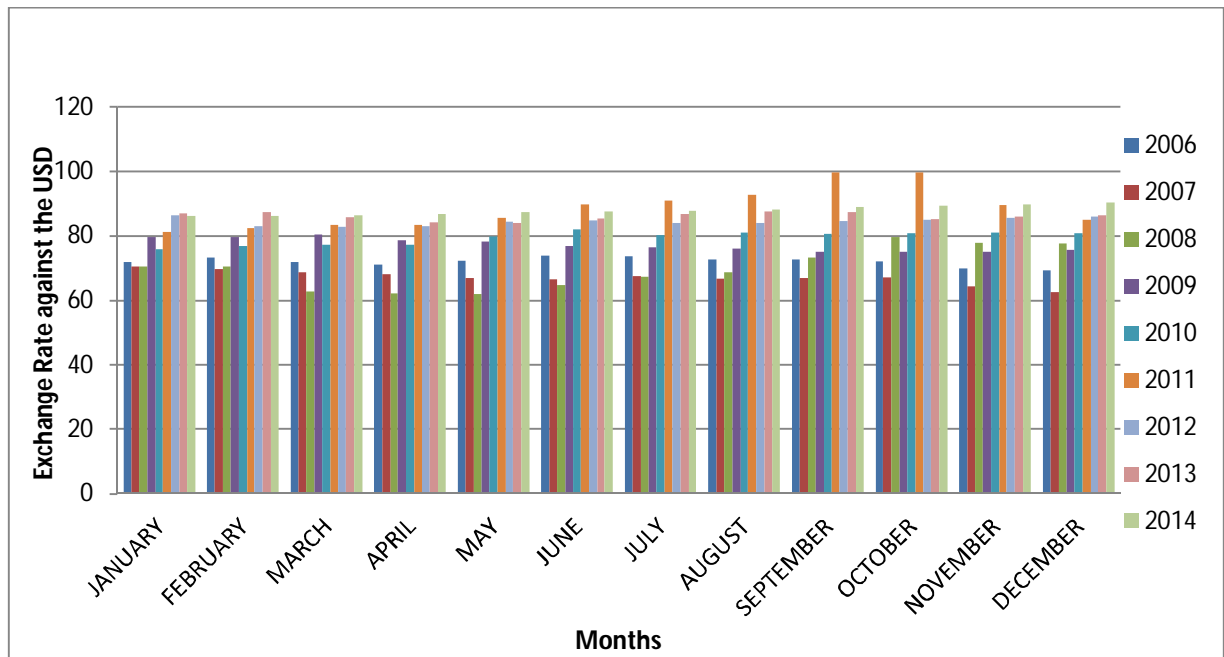
4.5: Correlation Analysis

The correlation coefficient, like the covariance, is a measure of the extent to which two measurement variables "vary together.

Table 4.1: Correlation Analysis

Correlations

		INFLATION	Volatility of Exchange	91 DAY T-BILL
INFLATION	Pearson Correlation	1	.521[**]	.491[**]
	Sig. (2-tailed)		.000	.000
	N	107	107	107
Volatility of Exchange	Pearson Correlation	.521[**]	1	.078
	Sig. (2-tailed)	.000		.422
	N	107	107	107
91 DAY T-BILL	Pearson Correlation	.491[**]	.078	1
	Sig. (2-tailed)	.000	.422	
	N	107	107	107

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

Given the results obtained in the table above, we can deduce that there is a positive correlation between the dependent variable and the independent variables. The correlation between inflation and the Volatility of the Exchange Rate stands at 52.1% while that of Inflation and the 91-Day T-Bill stands at 49.1%.

Coefficient of Determination

The Coefficient of determination explains the extent to which changes in the dependent variable (consumer price index (CPI) / Inflation) can be explained by the change in the

independent variables or the percentage of variation in the dependent variable that is explained by the two independent variables.

Table 4.2: Coefficient of Determination

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.747	.947		1.845	.068
	91 DAY T-BILL	.713	.112	.453	6.360	.000
	Volatility of Exchange	.105	.015	.485	6.814	.000

a. Dependent Variable: INFLATION

In order to determine the relationship between consumer price index and the four variables, the researcher conducted a multiple regression analysis. As per the SPSS generated table 4.3, the equation ($Y = \beta 0 + \beta 1 X1 + \beta 2 X2 + \varepsilon$) becomes: Y= 1.747+ 0.713 X1+ 0.105X2

Where:

Y = Consumer Price Index/ inflation (Dependent Variable)

X1 = Monthly Average of the 91-Day Treasury bill rate (Independent Variable)

X2 = Exchange Rate Volatility (USD) (Independent Variable)

As per the regression equation established, if the factors taken into account (91-Day Treasury bill rate and the exchange rate volatility) to be constant at zero, the consumer price index

would then be 1.747. The data findings analyzed also shows that if all other independent variables are assumed to be at zero, a unit increase in the 91-day Treasury bill rate will lead to a 0.713 unit increase in the consumer price index in Kenya. Further, a unit increase in the exchange rate Volatility will lead to a 0.105 unit increase in consumer price index in Kenya respectively.

From the above analysis of the betas, it can be inferred that 91-day Treasury bill rate contributes a lot to the consumer price index in Kenya at 0.713 followed by the Exchange rate volatility at 0.105.

At 5% level of significance and 95% level of confidence, both the 91 Day Treasury bill rate and the Exchange Rate Volatility had a 0. 000 level of significance; hence the most significant factor was 91-Day Treasury bill rate.

Table 4.3: Anova Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1241.227	2	620.613	47.130	.000[b]
	Residual	1369.494	104	13.168		
	Total	2610.721	106			

a. Dependent Variable: INFLATION

b. Predictors: (Constant), Volatility of Exchange , 91 DAY T-BILL

Ho – There is no statistically significant relationship between the dependent variable (Inflation) and the Independent Variables (Exchange Rate Volatility and the 91-day Treasury Bill Rate).

Ha – There is a statistically significant relationship between the dependent variable (Inflation) and the Independent Variables (Exchange Rare Volatility and the 91-day Treasury Bill Rate).

Decision rule:

If the sig < 0.05 reject the null

If the Sig > 0.05 accept the null

Given the results above; Where Sig <0.05 we reject the null and conclude that the independent variables have a statistically significant influence in the variation of inflation.

4.6 Regression Analysis

In order to establish the relationship among the variables (independent), the researcher conducted a multiple regression analysis. The analysis applied the statistical package for social sciences (SPSS) version 20 to compute the measurements of the multiple regressions for the study.

The findings were as shown in the table 4.2 below.

Table 4.4: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.690[a]	.475	.465	3.6288033

a. Predictors: (Constant), Volatility of Exchange , 91 DAY T-BILL

Data: 2015 Calculations

From the R- Square, we can deduce that 47.5% of the Consumer Price index in Kenya over the study period was attributed to the two independent factors – the 91day T- Bill rate and the Exchange Rate Volatility. The remainder, 52.5%, is attributable to other factors not considered in this study.

4.7. Discussion and Interpretation of the Findings

Variable inflation affects the smooth running of the financial system given its effect on the economic value of the local currency. To moderate this, many countries have given their respective Central Banks the object of price stability. As Bernanke (2006) pointed out, a high inflation complicates long-term economic planning, creating incentives for households and firms to shorten their horizons and to spend resources in managing inflation risk rather than focusing on the most productive activities while low and stable inflation brings stability to financial systems and fosters sustainable economic growth over the longer run. In Kenya, the inflationary rate, as measured by the consumer price index, has fluctuated greatly over the period of study. There are several factors that can be attributed to this.

From the regression analysis conducted above, the study established that the two factors studied here affected inflation by up to 47.5% indicating that there were other variables affected inflation (up to 52.5%) that had not been factored in this study. From the study, the rate of inflation seems to increase following increases in the exchange rate volatility and 91-day Treasury bill rate. This indicates that there is a positive relationship between these variables and the rates of inflation recorded in the country.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presented the summary of key data findings, conclusions drawn from the findings and the policy recommendations that were made. The conclusions and recommendations drawn were in quest of addressing research objectives of establishing the effect of the exchange rate volatility on the rate of inflation in Kenya.

5.2 Summary of Findings

The study set to establish the effects of the exchange rate volatility on the inflation rate in Kenya. To achieve this, the study used two variables i.e. the 91-day Treasury bill and exchange rate volatility (USD). The independent variable was the Consumer Price Index (CPI) which was used to deduce the general levels of inflation in the country by calculating how much a basket of goods was worth in different periods of time over the study period.

From the findings presented in chapter four above, the study illustrated that as Treasury bill increased, the rate of inflation reduced meaning that increasing the Treasury bill rate attracts more investors, both local and international to lend money to the Government so as to cash in on the good returns, thus reducing their immediate purchasing power. This has the result of reducing the amount of money in circulation hence reducing inflation.

The study further established that exchange rate system has an important role in reducing or minimizing the risk of fluctuations in exchange rates, which will have an impact on the economy. Any changes in exchange rates will have a great impact on the economy. An increase in exchange rates is accompanied by higher rates on inflation. This is partly due to increases in the Diaspora remittances. However, in general, exchange rates have limited effect on the levels of inflation recorded in Kenya.

5.2.1 Conclusion

From the results in chapter four and summary of findings above, this study deduces that exchange rate volatility as well as the T-Bill rate are relatively effective in controlling the levels of inflation recorded in Kenya. Through the 91-Day Treasury Bills, the Government of Kenya is able to borrow money from the public thus reduce the amount of money in the hands of its citizens for expenditure. This is further elaborated by the effect of 91 day Treasury bill rate influence on the levels of interest rates charged by commercial banks. If the 91 Day Treasury bill rate increases, it prompts an increase in the short term interest rates which then reduces the borrowing level of citizens as loans will have become more expensive. Even for the households with surplus income, they will be attracted to save to earn a higher interest hence bring down the levels of general retail prices (inflation) in the country.

The study also concludes that exchange rate is a very important element of the general levels of retail prices in Kenya. This is because Kenya is a net importer which means that it purchases more in foreign currency than it exports. This therefore means that imported goods

and services heavily rely on the prevailing rates of foreign exchange. As such it is important that the foreign exchange rates stability is maintained to maintain the general retail prices in Kenya.

5.2.2 Policy Recommendations

From the results of the empirical study, the following recommendations are proposed to encourage and improve the exchange rate stability in Kenya. Firstly, there is the need to put in place appropriate policies and strategies that will ensure the maintenance of a very stable inflation rate as this has been an important factor influencing exchange rate.

Secondly, the government should direct its budgetary allocation towards investments in the key productive sectors of the economy such as agriculture and manufacturing as this will go a long way in increasing the production of goods and services. The overproduction in these sectors will lead to increased exportation of goods leading to a more balanced exchange rate that is devoid of sharp fluctuations from time to time. It will also lead to a reduced dependence on the tourism sector, which is mainly dictated by the whims and benefit of the western countries that are the main sources of tourism.

The study also recommends that the Government, through its Kenya National Bureau of Statistics arm evaluates the prevailing levels of retail prices and pegs the prevailing interest rates on the 91-day Treasury bills because it is majorly treated as risk free rate hence determines other interest rates and eventually the levels of inflation in Kenya.

The government should also realize that exchange rate volatility is an important variable in influencing the levels of inflation and thus the general retail prices prevailing in Kenya. As such, the study recommends that the policy makers need to keenly control the volatility of the Kenyan exchange rate so as to ensure stable retail price levels by ensuring a smooth and consistent devaluation or revaluation of the same.

Given the very significant impact of the T-Bill rate on the Kenyan inflation rates, the study would recommend that the government should use it to control the rates at which the Kenyan shilling trades against other major currencies, particularly the US Dollar so as to regulate the sharp volatilities that have been experienced in some year under our study period.

The issue of country's capital budgeting portfolio should be handled in a serious way and some of the loans obtained pegged on the Kenyan Shilling rate of repayment instead of all repayments being done based on the US Dollar. This will in effect lead to lesser pressure on the Kenyan Shilling at around end month or during other periods when loans have to be repaid and obligations met.

5.3 Limitations of the Study

The main limitations faced in this study included the fact that only secondary data, which was earmarked for other purposes, was used data used. Another limitation was based on the fact that some data could not be found such as that relating to years prior to 2005 limiting the scope of our study and preventing the attainment of more accurate data. There was also the challenge of data reliability due to inconsistency of data from various data sources and there

is therefore the need for the government to synchronize all these data sources that emanate from the country.

5.4 Suggestions for Further Studies

The other limitation considered the fact that the study mainly concentrated its efforts on using time series generate data. Another study can therefore be done using panel data or any other estimation method available at the time. Another study can yet be commissioned comparing the effects of the exchange rate volatility on inflation between different sectors of the economy or different counties in the country and yet another one may utilize data from the black market as a contributing factor to the inverse relationship between inflation and the exchange rate volatility in the country. The measures used may keep on varying from one year to another subject to the prevailing condition. For example the inflation rate depends heavily on the base year statistics which may lead to different consumer price indices being obtained.

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APPENDICES

APPENDIX 1: DATA ON CONSUMER PRICE INDEX

MONTH/YEAR	2006	2007	2008	2009	2010	2011	2012	2013	2014
JANUARY	8.39	4.63	9.4	13.22	5.95	5.42	18.31	3.67	7.21
FEBRUARY	9.39	3.02	10.58	14.69	5.18	6.54	16.69	4.45	6.86
MARCH	8.85	2.19	11.9	14.6	3.97	9.19	15.61	4.11	6.27
APRIL	5.44	1.85	16.12	12.42	3.66	12.05	13.06	4.14	6.41
MAY	4.47	1.96	18.61	9.61	3.88	12.95	12.22	4.05	7.3
JUNE	4.28	4.07	17.87	8.6	3.49	14.48	10.05	4.91	7.39
JULY	4.16	5.48	17.12	8.44	3.57	15.53	7.74	6.03	7.67
AUGUST	4.92	5.3	18.33	7.36	3.22	16.67	6.09	6.67	8.36
SEPTEMBER	5.93	5.53	18.73	6.74	3.21	17.32	5.32	8.29	6.6
OCTOBER	6.55	5.38	18.74	6.62	3.18	18.91	4.14	7.76	6.43
NOVEMBER	6.64	6.08	19.54	5	3.84	19.72	3.25	7.36	6.09
DECEMBER	7.98	5.7	17.83	5.32	4.51	18.93	3.2	7.15	6.02

APPENDIX 2: DATA ON EXCHANGE RATES (USD)

MONTH/YEAR	2006	2007	2008	2009	2010	2011	2012	2013	2014
JANUARY	71.98	70.54	70.56	79.54	75.89	81.27	86.34	86.9	86.21
FEBRUARY	73.19	69.73	70.64	79.69	76.89	82.36	83.17	87.44	86.28
MARCH	71.87	68.78	62.76	80.43	77.33	83.55	82.89	85.82	86.49
APRIL	71.16	68.31	62.14	78.66	77.26	83.55	83.18	84.18	86.72
MAY	72.27	66.96	62.03	78.35	79.75	85.70	84.38	84.14	87.41
JUNE	73.88	66.56	64.69	77.02	81.92	89.86	84.78	85.48	87.61
JULY	73.62	67.51	67.32	76.61	80.23	91.10	84.14	86.86	87.77
AUGUST	72.62	66.75	68.73	76.23	81.07	92.85	84.07	87.49	88.11
SEPTEMBER	72.68	66.97	73.22	74.99	80.68	99.83	84.61	87.41	88.84
OCTOBER	72.02	67.11	79.65	75.24	80.78	99.77	85.11	85.31	89.23
NOVEMBER	69.95	64.42	77.86	74.91	80.97	89.72	85.63	86.1	89.96
DECEMBER	69.39	62.54	77.71	75.69	80.75	85.07	85.99	86.31	90.44

APPENDIX 3: DATA ON THE 91 DAY T-BILL RATE

MONTH/YEAR	2006	2007	2008	2009	2010	2011	2012	2013	2014
JANUARY	8.23	6.00	6.99	8.47	6.56	2.44	20.56	8.10	9.26
FEBRUARY	8.02	6.22	7.28	7.55	6.22	2.59	19.70	8.38	9.16
MARCH	7.60	6.32	6.89	7.31	6.1	2.77	17.80	9.88	8.97
APRIL	7.02	6.65	7.35	7.34	5.17	3.29	16.02	10.38	8.80
MAY	7.01	6.77	7.76	7.45	4.21	5.35	11.18	9.46	8.82
JUNE	6.60	6.53	7.73	7.33	2.98	8.95	10.09	6.21	9.81
JULY	5.89	6.52	8.03	7.22	1.60	8.99	11.95	5.92	9.78
AUGUST	5.96	7.30	8.02	7.25	1.83	9.23	10.93	10.03	8.29
SEPTEMBER	6.45	7.35	7.70	7.29	2.04	11.93	7.77	9.58	8.35
OCTOBER	6.83	7.55	7.75	7.26	2.12	14.80	8.98	9.17	8.67
NOVEMBER	6.41	7.52	8.39	7.22	2.21	16.14	9.80	9.95	8.64
DECEMBER	5.93	6.86	8.59	6.82	2.28	17.89	8.25	9.53	8.50

APPENDIX 4: DATA FED INTO THE SPSS 20

INFLATION	EXCHANGE RATE	Deviation from the mean score	Volatility of Exchange	91 Day T-BILL RATE
8.39	71.98	-0.07	0.00525624999999868	8.23
9.39	73.19	1.14	1.29390625000001000	8.02
8.85	71.87	-0.18	0.03330624999999650	7.60
5.44	71.16	-0.89	0.79655624999999700	7.02
4.47	72.27	0.22	0.04730625000000050	7.01
4.28	73.88	1.83	3.33975625000000000	6.60
4.16	73.62	1.57	2.45705625000003000	5.89
4.92	72.62	0.57	0.32205625000001100	5.96
5.93	72.68	0.63	0.39375625000001500	6.45
6.55	72.02	-0.03	0.00105624999999993	6.83
6.64	69.95	-2.10	4.42050624999997000	6.41
7.98	69.39	-2.66	7.08890624999997000	5.93
4.63	70.54	3.36	11.27840277777790000	6.00
3.02	69.73	2.55	6.49400277777784000	6.22
2.19	68.78	1.60	2.55466944444448000	6.32
1.85	68.31	1.13	1.27313611111114000	6.65
1.96	66.96	-0.22	0.04913611111110990	6.77
4.07	66.56	-0.62	0.38646944444443100	6.53
5.48	67.51	0.33	0.10780277777778700	6.52
5.30	66.75	-0.43	0.18633611111110300	7.30
5.53	66.97	-0.21	0.04480277777777450	7.35
5.38	67.11	-0.07	0.00513611111110992	7.55
6.08	64.42	-2.76	7.62680277777772000	7.52
5.70	62.54	-4.64	21.54506944444440000	6.86
9.40	70.56	0.78	0.61491736111110700	6.99
10.58	70.64	0.86	0.74678402777777000	7.28
11.90	62.76	-7.02	49.22191736111120000	6.89
16.12	62.14	-7.64	58.30595069444450000	7.35
18.61	62.03	-7.75	59.99793402777780000	7.76
17.87	64.69	-5.09	25.86570069444450000	7.73
17.12	67.32	-2.46	6.03111736111117000	8.03
18.33	68.73	-1.05	1.09376736111111000	8.02
18.73	73.22	3.44	11.86228402777770000	7.70
18.74	79.65	9.87	97.49916736111110000	7.75
19.54	77.86	8.08	65.35375069444440000	8.39
17.83	77.71	7.93	62.95100069444430000	8.59
13.22	79.54	2.26	5.10759999999996000	8.47
14.69	79.69	2.41	5.80809999999992000	7.55

14.60	80.43	3.15	9.92249999999995000	7.31
12.42	78.66	1.38	1.90439999999995000	7.34
9.61	78.35	1.07	1.14489999999995000	7.45
8.60	77.02	-0.26	0.06760000000001010	7.33
8.44	76.61	-0.67	0.44890000000002100	7.22
7.36	76.23	-1.05	1.10250000000002000	7.25
6.74	74.99	-2.29	5.24410000000009000	7.29
6.62	75.24	-2.04	4.16160000000008000	7.26
5.00	74.91	-2.37	5.61690000000009000	7.22
5.32	75.69	-1.59	2.52810000000006000	6.82
5.95	75.89	-3.57	12.74490000000000000	6.56
5.18	76.89	-2.57	6.60489999999997000	6.22
3.97	77.33	-2.13	4.53689999999998000	6.10
3.66	77.26	-2.20	4.83999999999995000	5.17
3.88	79.75	0.29	0.08410000000000360	4.21
3.49	81.92	2.46	6.05160000000004000	2.98
3.57	80.23	0.77	0.59290000000001600	1.60
3.22	81.07	1.61	2.59210000000000000	1.83
3.21	80.68	1.22	1.48840000000003000	2.04
3.18	80.78	1.32	1.74240000000002000	2.12
3.84	80.97	1.51	2.28010000000002000	2.21
4.51	80.75	1.29	1.66410000000002000	2.28
5.42	81.27	-7.45	55.49008402777800000	2.44
6.54	82.36	-6.36	40.43900069444460000	2.59
9.19	83.55	-5.17	26.72028402777800000	2.77
12.05	83.55	-5.17	26.72028402777800000	3.29
12.95	85.70	-3.02	9.11536736111118000	5.35
14.48	89.86	1.14	1.30150069444441000	8.95
15.53	91.10	2.38	5.66836736111102000	8.99
16.67	92.85	4.13	17.06378402777760000	9.23
17.32	99.83	11.11	123.45061736111110000	11.93
18.91	99.77	11.05	122.12091736111110000	14.80
19.72	89.72	1.00	1.00166736111108000	16.14
18.93	85.07	-3.65	13.31641736111130000	17.89
16.69	83.17	-1.35	1.83376736111112000	19.70
15.61	82.89	-1.63	2.67050069444446000	17.80
13.06	83.18	-1.34	1.80678402777778000	16.02
12.22	84.38	-0.14	0.02078402777778090	11.18
10.05	84.78	0.26	0.06545069444444170	10.09
7.74	84.14	-0.38	0.14758402777778200	11.95

6.09	84.07	-0.45	0.20626736111112300	10.93
5.32	84.61	0.09	0.00736736111110991	7.77
4.14	85.11	0.59	0.34320069444443600	8.98
3.25	85.63	1.11	1.22286736111109000	9.80
3.20	85.99	1.47	2.14866736111108000	8.25
3.67	86.90	0.78	0.60840000000000200	8.10
4.45	87.44	1.32	1.74239999999998000	8.38
4.11	85.82	-0.30	0.09000000000000680	9.88
4.14	84.18	-1.94	3.76359999999999000	10.38
4.05	84.14	-1.98	3.92040000000002000	9.46
4.91	85.48	-0.64	0.40960000000000100	6.21
6.03	86.86	0.74	0.54759999999999200	5.92
6.67	87.49	1.37	1.87689999999997000	10.03
8.29	87.41	1.29	1.66409999999998000	9.58
7.76	85.31	-0.81	0.65610000000000400	9.17
7.36	86.10	-0.02	0.00040000000000041	9.95
7.15	86.31	0.19	0.03609999999999910	9.53
7.21	86.21	-1.71	2.93265625000007000	9.26
6.86	86.28	-1.64	2.69780625000004000	9.16
6.27	86.49	-1.43	2.05205625000005000	8.97
6.41	86.72	-1.20	1.44600625000004000	8.80
7.30	87.41	-0.51	0.26265625000001700	8.82
7.39	87.61	-0.31	0.09765625000000890	9.81
7.67	87.77	-0.15	0.02325625000000540	9.78
8.36	88.11	0.19	0.03515624999999470	8.29
6.60	88.84	0.92	0.84180624999998100	8.35
6.43	89.23	1.31	1.70955624999997000	8.67
6.09	89.96	2.04	4.15140624999992000	8.64
6.02	90.44	2.52	6.33780624999992000	8.50