THE RELATIONSHIP BETWEEN SELECTED MACROECONOMICS VARIABLES AND FOREIGN EXCHANGE RATE IN KENYA

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DECLARATION

This research project is my original work and has not been presented for any award in any other university.

Sign:  Date: November 30, 2022

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This research project has been presented for examination with my approval as the University supervisor:

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DEDICATION

I dedicate this paper to my family. A special feeling of gratitude to my loving mother for her words of encouragement. I also dedicate this paper to my many friends who supported me throughout the process.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

ARDL	-	Autoregressive distributed lag
BEA	-	Bureau of Economic Analysis
BMG	-	Broad Money Growth
BOP	-	Balance of Payment
CBK	-	Central Bank of Kenya
COVID	-	Corona Virus Disease
CPI	-	Consumer Price Index
CYN	-	Chinese yuan
EA	-	Expenditure Approach
EGARCH	-	Exponential Generalized Autoregressive Conditional Heteroskedastic
FDI	-	Foreign Direct Investments
FX	-	Foreign exchange rate
GDP	-	Gross Domestic Product
GEI	-	Global Equity Indices
IA	-	Income Approach
IBM	-	International Business Machines
IMF	-	International Monetary Fund
IR	-	Interest Rate
IRP	-	Interest Rate Parity
KSH	-	Kenya Shillings
MEV	-	Macroeconomic Variables
NSE	-	Nairobi Securities Exchange
OA	-	Output Approach
OECD	-	Organisation for Economic Co-operation and Development
OLS	-	Ordinary Least Squares
PPP	-	Purchasing Power Parity
QTM	-	Quantity Theory of Money
SDR	-	Special Drawing Rates
SPSS	-	Statistical Package for the Social Sciences
U.S.	-	United States
USD	-	United States Dollar
VAR	-	Vector Autoregression
VIF	-	Variance Inflation Factor

ABSTRACT

Volatility of foreign exchange rate (FX) is unsolved gap in research, FX and other macroeconomic variables have significant influence on the Kenyan economic growth. The study sought to determine the association between selected macro-economic variables and FX in Kenya. Among key theories reviewed in this study included Interest Rate Parity, Purchasing Power Parity and Ricardian theories. This paper adopted use of a correlational research design and collected secondary data based on quarterly data for sixteen years between 2006 and 2021. Data was collected from the World Bank Development indicators and the Central Bank of Kenya. The study used both descriptive and inferential statistical analysis. Dialogistic tests of normality, heteroscedasticity, multicollinearity and serial correlation were done. The outcomes depict a negative effect of interest rate on FX. Further, inflation rate had a positive but insignificant effect while GDP growth rate had a negative insignificant effect on FX. Money supply on the other hand had a positive effect on FX. The study concluded that interest rate has a negative effect on FX in Kenya. It also concluded that money supply has a positive effect on FX in Kenya. Inflation rate and GDP growth rate have no substantial effect on FX in Kenya. The recommendations include the development of policies by the state that would increase the lending rate; increase the GDP growth rate optimally; and reduce money supply within the country hence reducing the rate at which the Kenya Shilling exchanges with USD. The government policies that would increase lending rate in Kenya, would lead to decreased FX of KSh to USD. The government should also come up with policies that would increase GDP growth rate optimally; and reduce money supply within the country hence reducing rate at which Kenya Shilling exchanges with USD. From the research, future studies could be done on different timespans; and other macroeconomic variables influencing Kenyan FX against USD and different measures of FX.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Kenya has experienced Foreign exchange rate (FX) volatility over the years, integration of regional economies and influences of macroeconomic factors on FX have also increased. Different macroeconomic fundamentals matter for FX movement during different time periods (Goldberg and Friedman, 2001). FX is differentiated by several factors in line with economy (Uddin et al, 2013) and has impact on economic growth of a country (Rizzo, 1998). FX stability is fundamental in ensuring country's sound economic and monetary policy objectives. Inflation rates, interest rates, BOP, national income, exports, import, balance of trade, Gross Domestic Product (GDP), public debt, terms of trade and economic performance metrics are determinants of FX (Bergen, 2010).

There are numerous underpinning theories explaining the relationships. Among the key theories reviewed in this study included interest rate parity and purchasing power parity and Ricardian theories. Interest Rate Parity (IRP) Condition of Keynes (1923) allows interest to forecast FX fluctuation given levels of expected FX in future. Mundell (1962) and Fleming (1962) equally regarded that variation in nominal IR drives real FX movement. The Cassel (1918) Purchasing Power Parity (PPP) purports that, FX between currencies is at equilibrium when their purchasing power is similar. Ricardian theory states that when there is an increase on international competitiveness of domestic industries, FX depreciation diverts spending from foreign goods to domestic goods.

World Bank reports global growth deceleration in 2022, from 5.5% to 4.1% and forecast 3.2% in 2023 due to disruptions by COVID-19. Global activity, supply disruptions, diminished fiscal support, high food and energy prices, have increased inflation across many countries. Global trade was 9.5% in 2021 and will slow to 5.8% in 2022 and 4.7% in 2023.

Consumer price inflation reached 4.6% in October 2021, up from pandemic-related deep of 1.2% in May 2020. Government debt in median LIC surpassed 58% of GDP in 2021.

1.1.1 Macroeconomic Variables

Macroeconomics studies the economy in eternity and examines issues like production growth, inflation, unemployment, government deficits, exports, and imports among others. Macroeconomics and microeconomics are interdependent and are both used in describing the state of the economy. Microeconomic focus on firms, individuals and industries while macroeconomic focus on the economy from a broad perspective.

Macro-economic variables are akin to the economy both at regional and national levels. Economic development may be influenced by fluctuations in macroeconomic variables (Roubini, 2000). These variables may include GDP, inflation, and interest rate. GDP refers to the market value of the final services and goods produced within a country's national borders within a given time frame. According to the Bureau of Economic Analysis (BEA) GDP refers to the value of services and goods produced by a nation less the cost of production.

Inflation is a rise in the general prices as a result of increased demand, cost push or import prices (Thirwall, 1974). It is persistent increase in the price levels of services and goods in an economy over a period of time and measures changes in price level of market basket of goods and services used by households. PPP theory states that FX between currencies is at equilibrium when the purchasing power is equal in two countries. Interest rates are costs and profit of borrowing capital, real interest rate is therefore significant to many economic theories to explain capital flight, economic bubbles and business cycle. Real interest rate refers to the interest rate adjusted to eliminate inflation effects to reflect the actual cost of funds to borrower and returns to the investor or lender.

1.1.2 Foreign Exchange Rate (FX)

Foreign exchange rate (FX) is the domestic price of a country's currency expressed in terms of a unit of another currency and differentiated by several economic factors. FX is the domestic price of a unit of foreign currency (Uddin et al, 2013), it is the price of one nations currency in comparison to another currency, often referred to as the base currency (Shaprio, 2010). FX is the volume of local currency needed to buy foreign currencies for instance pound, dollars and euros, it depicts the ratio of local currency in comparison to foreign currencies. FX is grouped into real and nominal FX.

The significance of FX is that it enables the state to attain market equilibrium between supply and demand by varying or shifting FX as opposed to applying foreign reserves for nations using the FX. This increases the flexibility of the monetary policy in an economy with a negligible effect on BOP. According to Ndugu (2001), flexible FX system is of essence to an economy since it reduces the interventions by CBK and increase foreign currency reserves as a result of the FX markets' demand and supply forces. Fixed FX keeps the currency within narrow band and help the importer and exporter to be more explicit in foreign trade while assisting governments to contain inflation.

Real FX takes into account inflation while nominal FX inflation disregards inflation (Taylor and Lothian, 1997). Nominal FX is determined by supply and demand forces as opposed to influencing a country's foreign currency reserves in the ascertaining of foreign exchange rate. FX systems can be classified as freely floating, managed/flexed float, fixed and pegged types. In fixed, currency is fixed as opposed to other currencies i.e.it doesn't vary with changes in economic variables or variations supply and demand forces like free floating. In fixed rate, currency value is fixed to a measure of value, like gold or another currency.

1.1.3 Macro-economic Variables and Foreign Exchange Rate

Foreign exchange rate (FX) is a significant economic variable allowing conversion of currency to another and facilitates international trade, prices, funds transfers and comparisons of goods and services between countries. Changes in macroeconomic variables cause oscillation in FX. Stiglitz and Furman (1999) argue that high-interest rates accrue to high level of cash outflows and high-interest rates to foreign nations struggling with FX instability due to shortages in foreign currency. On the other hand, low-interest rate draw foreign investors closer leading to high foreign cash inflows that stabilize local currencies and reduce inflation in the country due to adequate supply of foreign currency. This impacts other variables including GDP which will escalate due to trade surplus and increased production of services and goods. Customer spending increases during inflation to the extent that the demand surpass the supply level resulting to low interest rate and subsequently high foreign currency inflow hence stability in FX.

The association of FX and economic variables has complicated the equation since higher interest rates increase inflation rate which reduce the local consumers' purchasing power thus reduced demand for foreign currency hence low FX (Yunis & Elbanna, 2008). An improvement in GDP causes an increase in interest rates which increase borrowing costs, reduce disposable income which reduce inflation triggering an increase in FX. The FX plays a fundamental role in Kenya's economy since it participates in the FX market, stock market and international trade. Kirui, Onono and Wawire (2014) documented that FX fluctuations impact the stock market whether the currency depreciates or appreciates and backed by Musyoki, Pundo and Pokhariyal (2012) who argues that the Kenyan financial market or economic growth has been influenced by the FX volatilities.

1.1.4 Foreign Exchange Rate in Kenya

In Kenya, Central Bank does not set the FX; but rather prescribed by the market, demand and supply forces. Individual commercial banks and forex bureaus set their own rates which range within the normal exchange rates as a result of competition. The FX released by the CBK is an indicative rate, which guide those involved in exchange rate to ascertain the value of the shilling on a daily basis. This shows that Kenya's FX regime is free float dictated by demand and supply forces in the market.

Although Kenyan FX is less volatile than other regional currencies, the FX for the KSh. has generally weakened relative to the U.S. dollar over the past decade. The KSh appreciated by 4.8 percent to exchange at an average of KSh 84. 8 per USD in 2012. This shows that the there was a depreciation of the KSh from 2012 through to 2021. In 2021, the KSh has depreciated by 3.5% against the US Dollar (USD) to trade at KSh 113.14 per USD, mainly attributed to the increased dollar demand by energy sector and general importers with Kenya being a major net importer. Though lower than the 7.7% depreciation in 2020, has pushed the KSh to new all-time lows, with the KSh. closing at KSh. 113.0 as at 17th December 2021.

1.2 Research Problem

Volatility of FX is unsolved gap in research (Uddin et al, 2013) and FX and other macroeconomic variables have significant influence on the Kenyan economic growth (Hussain, Sabir, Hazoor, & Kashif, 2016). A country's economic growth and macro-economic fundamentals can therefore directly influence FX. Macroeconomic variables like interest rate, inflation, GDP growth as well as money supply play a key role in influencing FX of a country. Theoretical literature show that macroeconomic variables lead to FX fluctuations. Empirical studies have shown that macroeconomic variables influence FX of a country.

FX fluctuations have persisted in Kenya in the recent past which has increased the uncertainty levels for monetary policy objectives which policymakers often desire to attain; price stability, trade and economic growth. The official FX (LCU per US$, period average) for KSh has continued to depreciate over time from KSh 7.14 in the year 1963 to KSh 106.45 in the year 2020 and still depreciating, recording KSh114.29 in March 2022. Kenya has undergone significant changes in macroeconomic landscape over last ten years.

Different studies have been reviewed in the area of macroeconomic variables and FX. Fraz and Fatima (2017) looked at impact of macroeconomic variables on FX across developed and growing economies. The study found that macroeconomic variables and FX related significantly. Khan, Teng and Khan (2019) studied cointegration between macroeconomic factors and FX. They found GDP growth had a positive effect while inflation and interest rates had a negative effect on FX. Antwi, Issah, Patience and Antwi (2020) studied effect of macroeconomic variables on FX in Ghana. Real GDP had a significant effect with other macroeconomic variables having no significant effect on FX. Nor, Masron and Alabdullah (2020) in their study in Somalia found significant effect of macroeconomic variables on FX volatility.

In Kenya, Abdalla (2021) delved into the effects of macroeconomic variables on FX in Kenya; Bomin (2019) explored the impact of macroeconomic factors on FX between KSh and Euro Currency; while Ndambiri (2019) considered the effects of interest rate capping on FX based on commercial banks listed at NSE. The studies have shown key gaps. Conceptually, Abdalla (2021) adopted measured macroeconomic variables through different measures like political index different from current study. In addition, Bomin (2019) used KSh per Euro to measure FX with current study using KSh per USD. Ndambiri (2019) studied interest rate capping other than macroeconomic variables that influence FX.

Contextually, Ndambiri (2019) based analysis on commercial banks. Methodologically, Abdalla (2021) adopted different study period (2010-2019) with analysis done through regression analysis only other than a combination with correlation analysis. Bomin (2019) focused on period between 2010 and 2018 while adopting annual data other than 2006 to 2021 using USD. The study sought to answer the question on the relationship between selected macroeconomic variables and FX in Kenya.

1.3 Research Objective

To determine the relationship between selected macro-economic variables and FX in Kenya.

1.4 Value of the Study

This study may be of value to various stakeholders based on its contribution to theory, policy and practice. This study may contribute to theoretical literature available on macroeconomic variables and FX. In its addition to existing body of knowledge, the research would be valuable in that, it contributes to academic and business research purpose and enhance macroeconomic theory reviews. This would make it important to scholars to use the literature for academic assignments. The researchers would also benefit in that they would get a basis for further research based on gaps in the study.

For policy, the study may be valuable to CBK, and the ministry of finance in their policy formulation and development in relation to macroeconomic environment of the country. It may be significant for regulators like CBK in ensuring stability of FX in the market. The study may benefit policy makers on influences of macroeconomic drivers during policy formulation including monetary and fiscal policy in stabilising the economy when budgeting spending, creating taxes, deciding on IR, and making policy decisions.

For practice, the study will inform public on trends, performance and overall health of Kenyan economy. Planners, investors and businesses use macroeconomic analysis to forecast

demand for their products and services and to anticipate how consumers' incomes will grow when expanding their production. Consumers would want to know trends on cost of goods and services in the market and the cost of borrowing money. Therefore, the study may provide a basis for strategy formulation for improved FX and macroeconomic environment.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviewed both empirical and theoretical literature relating to selected macroeconomic variables and FX. The chapter also contains the determinants of FX as well as the conceptual framework. The chapter closes with a summary of the literature.

2.2 Theoretical Review

Reviewing underpinning theories and empirical literature, there are a large number of factors considered responsible for increasing FX over time (Uddin et al, 2013). Numerous theories and models that have been developed and modified over time explain FX rate behaviour. These include Quantity Theory of Money (QTM), the Balance of Payment approach (BOP), Purchasing Power Parity (PPP) / Inflation Differential, Interest Rate Parity (IRP) approach, the monetary models, the equilibrium and liquidity models and the portfolio approach.

2.2.1 Interest Rate Parity Theory

Interest Rate Parity (IRP) theory formalized by Keynes (1923), allows interest to forecast FX fluctuation given the level of expected FX. It suggests that interest rate differential between two nations is equal to the differences between the two countries' spot FX and forward FX, IRP is equilibrium condition between the rates of return on comparable assets between two nations. When faced with higher real rate of interest, demand for credit become high and money transfer from consumption to savings, ideally, lower real rate of interest results in investment and consumption. In the contrary the theory argues that transactions on a nation's financial account influence the FX value on FX market (Schmitz, 2010). The interest rate parity may be divided into the covered and uncovered interest rate parity. Covered interest rate parity applies when no-arbitrage condition could be met via application of forward

contracts in an effort to control foreign exchange risks (Jaweed and Raja, 2014). The uncovered interest rate parity on the other hand refers to when the no-arbitrage condition is satiable without the application of forward contracts to mitigate FX risks (Aliber, 1973).

Critiques argue that IRP theory neglects the transaction cost, with-holding taxes and exchange rate hence not practical. The forward FX to a large extent is premised on the interests rate differential. It presumes that arbitrageurs shall intervene whenever a variation exists between the interest rate differential and the forward rate differential. Additionally, the funds which may be used for arbitrage is not prescribed. Furthermore, the essence of capital flows, when available, is dependent on the credit conditions of the financial institution.

Interest rate parity is a fundamental theory in international finance and macroeconomic models since it is the convenient approach to demonstrate how FX values are computed and why FX varies. This model plays a fundamental role in FX markets, connecting FX, interest rates and spot FX. The interest rate parity gives an idea of the arbitrage in the FX markets implying that the investors cannot remain in the current FX in one currency at a lower price and purchase a different currency from a nation offering a high interest rate (Levich, 2013). This theory was used in this study to demonstrate the value and movement of interest rates and to analyse the relationship between the interest rate and FX.

2.2.2 Ricardian Theory of Comparative Advantage

Ricardian theory of comparative advantage or economic theory was advanced by David Ricardo in the 19th Century. It is based on labour theory of value and forms the basis of neoclassical trade theories and attributes benefits of international trade to variations in opportunity costs of production of similar commodities among nations. When there is an increase on international competitiveness of domestic industries, “FX depreciation shifts expenditure from spending on foreign to domestic goods. Dornbusch (1988) and Guitian

(1976) purport that success of currency depreciation in the promotion of balance of trade is dependent on switching demand in proper direction and amount and capacity of home economy to meet additional demand through supply of more goods.

In real world, almost no country produces only the goods which they possess comparative advantage. This creates a limitation in the theory. The theory also ignores factors such as transport costs as it only considers labour costs and neglects all non-labour costs involved in the production of the commodities. The theory also assumes that goods are homogeneous ignoring intra- firm trade, such as that between subsidiaries of a multinational firm. This makes the theory unrealistic.

The theory is relevant as it asserts that currency depreciation from initial trade deficit reduces the real national income and results to a decline in the total demand. Currency depreciation lowers export prices and raises import prices. Integration between FX and trade would therefore make it necessary to test the influence. The Ricardian model became more relevant in that it explains the macroeconomic variables like FX and national income growth.

2.2.3 Purchasing Power Parity Theory

The Purchasing Power Parity (PPP) theory is credited to Swedish economist Gustav Cassel (1918), its basis is the law of one price, stating that two currencies present equilibrium when a basket of goods is priced similar in both countries. The consumer price index (CPI) measures rate at which prices of consumer goods vary with time. The CPI can be used to index real value of salaries, wages price regulation and pension. In the developing economies, FX fluctuations can significantly affect the general level of prices (Dornbusch, 1976). The theory suggests that price differentials in trade between partners determine FX of the two currencies.

This theory was criticized as it ignores other factors involved in exports and imports, Keynes pointed out that a PPP computed from traded goods prices is close to a truism drawing implication that wholesale price index is a poor basis for computing PPP. The PPP theory is also criticized for the measuring component price- indices applied for the measurement of every country's currency rates. Nurkse (1947) objected the theory for advancing only price changes as precursor factors of FX. The theory further ignored the expenditure and income variation and variations affect the FX. Issues that influence accuracy of CPI include substitution biases, changes in quality and introduction of new products

The CPI has the probability of overstating inflation since does not account for improvements or new services and goods on matters relating to quality. The theory was applicable to the study as its used to compare various currencies via a basket of goods approach. The theory is also useful in the understanding of the factors underlying inflation rate fluctuations in a nation.

2.3. Determinants of Foreign Exchange Rates (FX)

2.3.1 Macroeconomic Variables

Devereux and Yetman (2010) describe an interest rate as the amount of money paid by the borrower for using money he does not own, which has to be refunded to the lender who collects the consumption of the borrower. In other words, interest rate is percentage of the amount borrowed over a given time frame. Interest rates refer to one of the macro-economic factors which affect the FX. Empirically, Khan, Teng and Khan (2019) found interest rates negatively influence the FX rate. However, Antwi, Issah, Patience and Antwi (2020) found that lending rate did not have effect on FX.

GDP is an aggregate measure of production which equals sum of gross values added of all resident institutional units engaged in production plus any taxes, and minus any subsidies, on

products not included in value of their outputs as defined by the Organisation for Economic Co-operation and Development (OECD). It is determined in multiple ways including income approach (IA), expenditure approach (EA) and output approach (OA). Amadeo (2018) defines GDP as an increase in capacity of an economy to produce goods and services, compared from one period of time to another. Real GDP is used as a proxy for output of the economy which is calculated by the constant price in 2005. After been adjusted by the price level (CPI), the real GDP gives a better performance for output change. Antwi, Issah, Patience and Antwi (2020) found that GDP growth had a significant effect on FX.

Inflation is globally considered as a monetary phenomenon (Friedman, 1963) and changes in price level are the main determinant of movements in FX (Otuori, 2013). A nation with lower inflation compared to another witnesses an appreciation in the value of its FX. Countries with consistently lower inflation rate exhibits rising currency value while countries with higher inflation realise depreciation in their currency. There are several measures of inflation such as GDP deflator and CPI but Kenya uses CPI as a main inflation measure. The Consumer Price Index (CPI) is therefore used in this study to measure inflation. Khan, Teng and Khan (2019) found inflation rates had a negative effect on the FX rate. However, Antwi, Issah, Patience and Antwi (2020) found that inflation did not granger cause FX.

2.3.2 Money Supply

Broad money supply calculates a nation's money supply by totalling assets that households and enterprises can leverage to advance payments or conduct short term investments including currency, funds in bank accounts and anything that generates value. Theoretically Keynes had explained that when money supply increases FX increases. High money supply implies increasing the money supply of foreign currencies thus positively influencing the FX value and improving the local currency hence enabling a county to manoeuvre harsh

economic condition (Fraz & Fatima, 2017). There is well-established long-run empirical relationship between broad money growth and FX rate across variety of countries and monetary regimes. Antwi, Issah, Patience and Antwi (2020) found that money supply did not influence FX rate.

2.4 Empirical Review

Fraz and Fatima (2017) studied the impact of macro-economic variables on FX in advanced and developing nations. Three G7 countries Canada, Japan and UK and three developing countries of South Africa, India and Brazil were studied. Using the Granger causality test and OLS regression the findings reveal that GDP growth, interest rate and inflation had a strong influence on the FX for both developing ad developed nations. The study also used the panel data analysis and found a strong and significant impact of all macroeconomic variables on FX. This study, despite looking at similar concepts compared to the current study, it was done in different economies. The study used Granger causality test which is a different research methodology from the one adopted in the current study.

Khan, Teng and Khan (2019) investigated the impact of macroeconomic variables on the FX USD/Chinese Yuan using yearly time series data for the Chinese economy from 1980 to 2017. The study used the ARDL bounds test Cointegration approach to measure the long-run relation between the variables. The findings revealed that gross domestic product growth and trade openness had a positive impact on FX USD/ Chinese Yuan while interest and inflation rates had a negative effect on FX rate. This study was based on USD/Chinese Yuan while the current is based on KSh/USD as the measure of FX. The study used annual data between 1980 and 2017 with the current research using annual data between 2006 and 2021. The study used ARDL with the current study using regression and correlation for data analysis.

Antwi, Issah, Patience and Antwi (2020) studied the effect of macroeconomic variables on FX rate: Evidence from Ghana. The investigation studied the impact of macroeconomic variables on FX in Ghana and utilized VAR and focusing on impact of broad money supply (M2), inflation, lending rate and real GDP on FX, for 76 quarterly observations between the time frame 2000–2019, in Ghana and to explore their effectiveness in management of FX rate in Ghana. The findings revealed that real GDP granger causes FX in Ghana. However, inflation, lending rate and money supply do not granger cause FX in Ghana but they affect FX indirectly. This study was based in Ghana which may experience different economic turbulence compared to Kenya where the current research is based. The study focused on the period between 2000 and 2019 with the current focusing on 2006 to 2021.

Nor, Masron and Alabdullah (2020) studied macroeconomic variables and the FX volatility: empirical evidence from Somalia. The research established that although Somali shilling circulated without regulations when there was no defined government, the circulation has experienced a lot of FX volatility. This study adopted the EGARCH model with the current adopting the regression model for analysis. The study was also based in Somalia which is a different contextual condition compared to Kenya where the current will be based.

Bomin (2019) studied the impact of macro-economic factors on FX between KSh and Euro currency. The study adopted data for a 9 years' frame (2010-2018). Data was retrieved from CBK, KNBS, World Bank data and data analysis executed using IBM SPSS. A multiple linear regression model was used to measure the association between three independent variables. On the influence of interest rates on FX, results showed a negative relationship between interest rate and FX that's not statistically significant. On the impact of inflation rates, results indicated a positive association between inflation rate and FX that's not statistically significant. On the effect of GDP growth rates results presented a positive

association between GDP growth rate and FX, however it is not statistically significant. This study despite looking at macroeconomic variables and FX, the researcher adopted the period between 2010 and 2018. The researcher also used annual data with the current using quarterly data. The researcher also used KSh/Euro to measure foreign exchange rate with the current study using KSh per USD.

Abdalla (2021) did a study on the effect of macro-economic variables on FX in Kenya. The investigation covered a ten year time frame from 2010 to December 2019. From the regression, a negative significant association existed between inflation and FX, positive significant relationship between interest rates and GDP growth rate and FX. The results did not however a significant association between broad money supply and FX. Political stability index was noted to be a significant explainer of FX. The research used different macroeconomic variables like political index compared to the current study. The researcher also adopted different study period (2010-2019) from the current research (2006-2021). The study adopted regression analysis only with the current study combining it with correlation analysis.

Ndambiri (2019) studied the effects of interest rate capping on the FX in Kenya based on commercial banks quoted at NSE. The study employed quantitative research design using a correlational research approach, which was found to be viable in utilizing quantitative data in explaining a complex phenomenon such as the effects of monetary policies like setting a ceiling for the interest rate. The primary units of analysis included the quoted Kenyan commercial banks. The research used financial statements obtained from the CBK and the audited financial statements from the identified commercial banks, for the past two years, ever since the Kenya Banking Amendment Act of 2016 came into force. The main interest of focus was the monthly interest rates, the monthly FX and the foreign currency trade volume

for the financial year, 2017/2018. Inferential statistics, through adoption of linear regression was used to make causal relationships between interest rate, FX and FX trade. The investigation also established that there existed a negative correlation coefficient between interest rates and foreign currency trade. The findings revealed a strong negative correlation between interest rates and foreign currency trade. The study involved commercial banks assuming national focus of current study. The study looked at interest rate capping other than selected macroeconomic variables that influence FX.

2.5 Conceptual Framework

Macro-economic factors are pertinent to broad economy and foreign exchange fluctuations within a nation. The selected macroeconomic variables and FX are conceptualized in figure 2.1. The independent variables will be selected macroeconomic variables of interest rate, GDP growth and inflation. The dependent variable will be FX as measured by KSh per USD. Money supply will act as the control variable

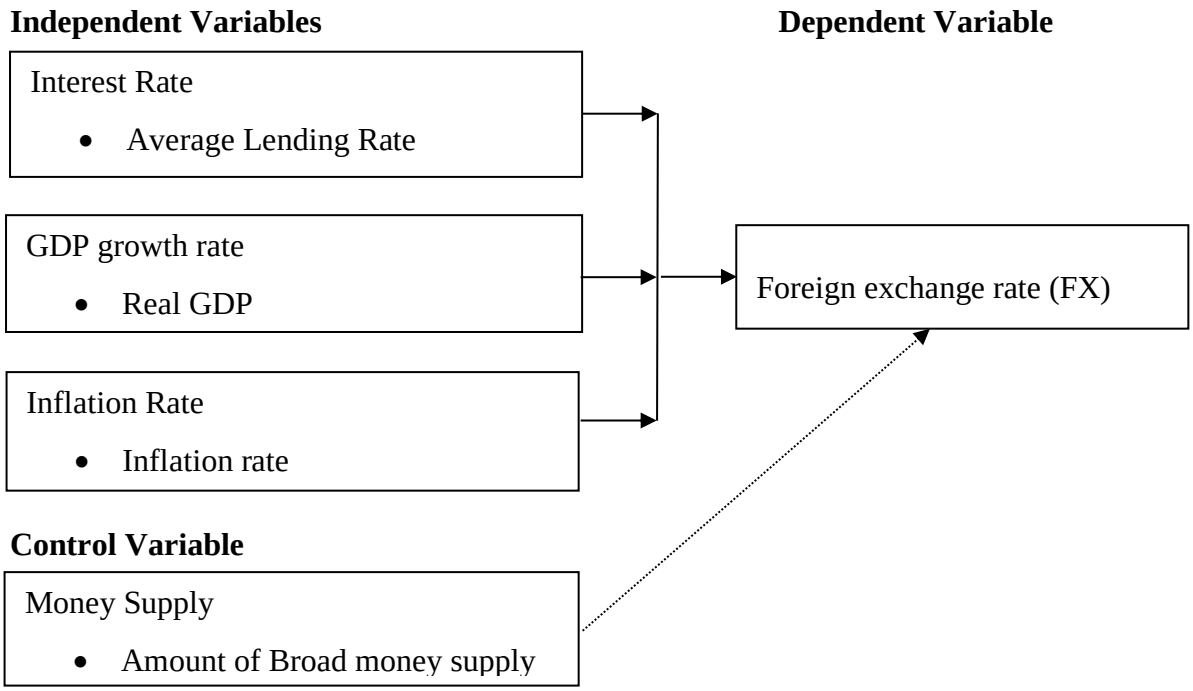

Figure 2.1: Conceptual model

Source – Researcher

2.6 Summary of the Literature Review

The section reviewed literature on the effect of selected macro-economic variables on FX in Kenya. Reviewing theoretical and empirical literature, a large number of factors and underpinning theories are considered responsible for increasing FX over time. Inflation rates, interest rates, money supply and GDP growth are the determinants of FX from the literature. The empirical studies reviewed shows that there is a relationship between FX and macroeconomic variables

The local studies show that research gaps exist. Abdalla (2021) adopted measured macroeconomic variables through different measures like political index different from the present research. Additionally, Bomin (2019) used Ksh/Euro to measure foreign exchange rate with the current study using KSh per USD. Ndambiri (2019) studied interest rate capping other than macroeconomic variables that influence foreign exchange rate. On the other hand, Ndambiri (2019) based the analysis on commercial banks showing a contextual gap. In addition, methodological gaps exist. For example, Abdalla (2021) adopted different study period (2010-2019) with analysis done through regression analysis only other than a combination with correlation analysis. Bomin (2019) focused on period between 2010 and 2018 while adopting annual data other than 2006 to 2021 using annual data.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter describes research methodology adopted for the study. The chapter explains the research design applied, data collection methods utilised as well as the data analysis procedures undertaken.

3.2 Research Design

The investigation adopted use of a correlational research design. This kind of research design establishes the relationship among variables adopted within a study. In relation to this study, this design enabled the researcher to establish the correlation between macroeconomic variables and FX in Kenya.

3.3 Population

This was a case study of Kenya.

3.4 Data Collection

Secondary data was applied in the study. The researcher investigator gathered quarterly data for a 16 year period between 2006 and 2021. The data was collected from the World Bank Development indicators and the CBK. The World Bank Development indicators and the CBK are preferred as they give credible data which makes the outcomes and the study credible as far as the macroeconomic variables and FX is concerned. The data was collected through a data collection sheet. The data collection sheet contained information relating to money supply, FX, interest rate, inflation rate and GDP growth rate. The data was in percentage form for interest rate, inflation rate and GDP growth rate but in KSh for FX and money supply.

3.5 Data Analysis

The research utilized both the inferential and descriptive statistical analysis. Descriptive statistics described the data through mean and standard deviation. Inferential statistics inferred the relationship among the variables. This was done through regression and correlation analysis. Correlation analysis was done through Pearson product moment coefficient. Regression analysis took the form of a multiple regression model. The analysis was done through SPSS 25 which assisted in generating the statistics for analysis.

3.5.1 Diagnostic Tests

The diagnostic tests used included normality, heteroskedasticity, multicollinearity and serial correlation. Normality was conducted to ascertain whether the data follows a normal distribution. This was tested using Shapiro Wilk test. The test assumed that the data is normal. When the p value exceeds 0.05, the researcher assumed that the data is normally distributed. However, with the p value less than 0.05, the data is not normally distributed. To resolve this, the researcher could transform the variables.

Heteroscedasticity was tested using the Breusch-Pagan. This tested whether the error term of residuals is constant over a given time frame. The test assumed that the error term is constant. This assumption is confirmed where the significance value was greater than 0.05. Where the significance value was less than 0.05, then the error term was not constant and heteroskedasticity exists in the data. To resolve this, the researcher used robust standard errors or otherwise adds other variables to the regression.

The study adopted variance inflation factor (VIF) to assess multicollinearity where one or more predictors may be highly correlated with one. The test assumed that there is no multicollinearity in the data. Where the VIF value was less than 5, the researcher assumed

that there are no multicollinearity issues. If the values are above, multicollinearity exists in the data. In this case, the highly correlated variable was removed and the test done again.

Serial correlation was tested using Durbin Watson. It tests the degree of similarity between values of same variables over successive time intervals. The test assumed that no serial correlation exists, where the pvalue was above 0.05. However, where the pvalue was below 0.05, serial correlation exists in the data. In this case, the researcher could resolve it through the use of generalized least squares.

3.5.2 Analytical Model

The study adopted the analytical model in form of;

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \boldsymbol{\epsilon}$$

Where;

Y_t = Foreign exchange rate (FX) as measured by KSh/USD at time, t

β_0 = Constant term

X_{1t} = Interest rate as measured by average lending rate at time, t

X_{2t} = GDP growth rate as measured by real GDP growth rate at time, t

X_{3t} = Inflation as measured by inflation rate at time, t

X_{4t} = Money supply as measured by broad money supply at time, t

β_1-β_4 = Regression coefficients

$\boldsymbol{\epsilon}$ = Error term

t = Year

3.5.3 Tests of Significance

These were generated using the Analysis of Variance. F-test was used in regression analysis to test the model's significance and hypothesis that all parameters in the model are zero. It further applied used in statistical analysis during comparison of statistical models which have been measured using a similar set of underlying factors. The t-statistics were used to show the significance of the variables that were adopted. The statistics were generated using SPSS 25.

CHAPTER FOUR: DATA ANALYSIS, INTERPRETATIONS AND DISCUSSIONS

4.1 Introduction

The section analyses, interprets the data outcomes while making discussions to relate the outcomes to the literature. The researcher targeted quarterly data between 1996 and 2021. However, the data was only available for the years 2006 to 2021 which was used for analysis.

4.2 Descriptive Statistics

Table 4.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Foreign exchange rate	64	65.40	109.77	89.3906	12.38046
Interest rate	64	11.88	20.21	14.6654	2.17910
Inflation rate	64	-5.70	11.90	5.0141	2.44598
GDP growth rate	64	3.56	18.14	7.4050	3.65582
Money supply	64	13.25	15.26	14.4096	.60958

From the descriptive analysis, FX had a mean of 89.39 KSh/USD between 2006 and 2021. Interest rate, however, averaged at 14.67% within the period. Further, inflation rate averaged at 5.04% between 2006 and 2021. GDP growth rate showed an average value of 7.41%. Finally, money supply showed an average log of 14.41 indicating that the money supply was above a million KSh.

4.3 Correlation Analysis

Table 4.2: Correlation Analysis

		Foreign exchange rate	Interest rate	Inflation rate	GDP growth rate	Money supply
Foreign exchange rate	Pearson Correlation	1	-.330**	.105	-.385**	.776**
	Sig. (2-tailed)		.008	.411	.002	.000
	N	64	64	64	64	64
Interest rate	Pearson Correlation	-.330**	1	.041	.366**	-.144
	Sig. (2-tailed)	.008		.747	.003	.257
	N	64	64	64	64	64
Inflation rate	Pearson Correlation	.105	.041	1	-.238	-.011
	Sig. (2-tailed)	.411	.747		.059	.932
	N	64	64	64	64	64
GDP growth rate	Pearson Correlation	-.385**	.366**	-.238	1	-.301*
	Sig. (2-tailed)	.002	.003	.059		.016
	N	64	64	64	64	64
Money supply	Pearson Correlation	.776**	-.144	-.011	-.301*	1
	Sig. (2-tailed)	.000	.257	.932	.016	
	N	64	64	64	64	64

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

From the correlations, FX and interest rate possessed a weak negative relationship (r=-0.330; p=0.008). Inflation rate depicted a weak positive but insignificant association with foreign exchange rate (r=0.105; p=0.411) while GDP growth rate had a negative relationship with foreign exchange rate (r=-0.385; p=0.002). Finally, money supply showed a strong positive relationship with foreign exchange rate (r=0.776; p=0.000). All the variables showed a significant relationship with FX except for inflation rate which displayed an insignificant relationship.

4.4 Diagnostic Tests

Table 4.3: Normality

	Statistic	df	Sig.
Foreign exchange rate	.941	64	.004
Interest rate	.911	64	.000
Inflation rate	.863	64	.000
GDP growth rate	.758	64	.000
Money supply	.928	64	.001

From the normality test, the Shapiro Wilk tests showed sig. of less than 0.05. This is a depiction that the null hypothesis of normality should be rejected. Hence, researcher made a conclusion that the variable dataset adopted in this survey is not under normal distribution.

Table 4.4: Multicollinearity

	Tolerance	VIF
Interest rate	.848	1.179
Inflation rate	.918	1.089
GDP growth rate	.738	1.354
Money supply	.902	1.109
Mean VIF		1.183

From the multicollinearity testing via VIF, the VIFs were below 5 indicating low variance inflations. The VIFs averaged at 1.183 for the variables. Hence, a conclusion made that there are no collinearity issues within the dataset.

Table 4.5: Heteroskedasticity Test

Breusch-Pagan Test for Heteroskedasticity[a,b,c]

Chi-Square	df	Sig.
2.053	1	.152

a. Dependent variable: Foreign exchange rate
b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.
c. Predicted values from design: Intercept + X1 + X2 + X3 + X4

From the Breusch-Pagan statistics of 2.053 showed sig value of 0.152. This meant non-rejection of the null hypothesis that that the variance of the errors is not dependent on independent variables values. Hence, a conclusion made that the data does not exhibit any traits of heteroskedasticity.

Table 4.6: Serial Correlation

Model	Durbin-Watson
1	2.000

The Durbin Watson statistic was 2.000. This indicates that there was no serial correlation in the data adopted in this research.

4.5 Regression Analysis

Table 4.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.818[a]	.669	.646	7.36347

a. Predictors: (Constant), Money supply, Inflation rate, Interest rate, GDP growth rate

The model summary displays a correlation (R) of 0.818 indicating that interest rate, GDP growth rate, inflation and money supply possess a strong link with foreign exchange rate in Kenya. The model further also showed an R^2 of 0.669. This depicts that interest rate, GDP growth rate, money supply and inflation contribute 66.9% to the FX in Kenya.

Analysis of Variance

Table 4.8: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6457.347	4	1614.337	29.773	.000[b]
	Residual	3199.024	59	54.221		
	Total	9656.371	63			

b. Dependent Variable: Foreign exchange rate
c. Predictors: (Constant), Money supply, Inflation rate, Interest rate, GDP growth rate

The ANOVA outcomes display an F-value of 29.773 with a sig. of 0.000. The sig. was below 5% an indication that interest rate, GDP growth rate, inflation and money supply have a significant effect on FX in Kenya. It also shows that the model significantly fits the data.

Table 4.9: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-107.346	24.923		-4.307	.000
	Interest rate	-1.169	.462	-.206	-2.529	.014
	Inflation rate	.532	.396	.105	1.345	.184
	GDP growth rate	-.224	.295	-.066	-.758	.452
	Money supply	14.773	1.603	.727	9.217	.000

a. Dependent Variable: Foreign exchange rate

From the coefficients, holding all predictors constant, the FX in Kenya would be at -107 KSh/USD. A unit increment in Interest rate reduces the FX by -1.169 KSh/USD. Nevertheless, increased inflation rate by a unit would increase FX by 0.532 KSh/USD. On the other hand, unitary increase in GDP growth rate would reduce FX by 0.224 KSh/USD. Finally, a unit increases money supply would increase FX by 14.773 KSh/USD. Only interest rate and money supply showed a significant effect on FX. Inflation rate and GDP growth rate had inconsequential effects on FX rate.

4.6 Discussions of Findings

The outcomes depict that increment in interest rate reduced FX. This reflects a negative effect of interest rate on FX. The findings are the same as Ndambiri (2019) who depicted that an inverse linkage existed around interest rates and FX. Nevertheless, it's dissimilar with Bomin (2019) who produced a non-substantial effect around interest rate and FX. Further, Abdalla (2021) also produced dissimilar outcomes where interest rate had a favourable linkage with on FX.

Further, increased inflation rate was found to increase FX insignificantly. Hence, inflation rate has a positive but negligible impact on FX. This stipulates that increased inflation would

have no significant effect on FX. The outcomes are similar to Bomin (2019) who displayed an insignificant connection around inflation and FX. The outcomes are different from Khan, Teng and Khan (2019) who showed inflation rates had a negative effect on FX.

On the other hand, increased GDP growth rate reduced FX but not substantially. This indicates that GDP growth rate reduces the FX in a country. The outcomes differed with those of Bomin (2019) who produced a positive connection around GDP growth rate and FX. They also differed with those of Abdalla (2021) who found a positive connection around GDP growth rate and FX.

Further, increased money supply increase FX significantly, this is an indication that money supply had a positive effect on FX. The findings concur with those of Fraz & Fatima (2017) who found that high money supply affected FX positively. They differ with Antwi et al (2020) who found that money supply did not influence FX.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarized the outcomes in line with the research objective as well as the variables. It also made conclusions, recommendations while describing the limitations and making recommendations into the areas for future studies.

5.2 Summary of Findings

The descriptive analysis shows that FX rate has a mean of 89.39 KSh/USD between 2006 and 2021. Interest rate averaged at 14.67%, inflation rate averaged at 5.04%; GDP growth rate showed an average value of 7.41% and money supply showed an average log of 14.41.

From the correlations, FX and interest rate possessed a weak negative relationship. On the other hand, inflation rate revealed a weak positive but insignificant association with FX while GDP growth rate had a negative relationship with FX. Finally, money supply showed a strong positive relationship with FX. All the variables showed a significant relationship with FX except for inflation rate which displayed an insignificant relationship.

The model summary displayed that interest rate, GDP growth rate, inflation and money supply possess a strong link with FX in Kenya. Further, interest rate, GDP growth rate, inflation and money supply contribute 66.9% to the FX in Kenya. The ANOVA outcomes depicted that interest rate, GDP growth rate, inflation and money supply have a significant effect on FX in Kenya. From the coefficients, increment in interest rate reduced the FX significantly while inflation rate increased FX insignificantly. On the other hand, increase in GDP growth rate reduced FX insignificantly while increased money supply increased FX significantly. This shows that interest rate had a negative impact on FX while money supply had a positive effect on FX. However, inflation rate (positive) and GDP growth rate (negative) had inconsequential effects on FX.

Inherent limitations can prevent researchers from predicting performance accurately and to know exactly how certain policies recommendations might affect different sectors and economies. The first limitation of the study was that, there are many macro-economic variables and factors in play that can influence FX models. It is also impossible to precisely recreate market conditions, nor predict outcomes based on how markets have behaved in the past under similar circumstances.

Secondly, there was methodological limitation of having sufficient sample size to draw valid inferences. Larger sample size gives more precise results. The time period was only 16 years as opposed to 60 years since Kenya gained her independence. A longer period may have produced better results as the supplementary data would give more credible results.

Thirdly, depending on the scope the study, similar prior research studies on macro-economic variables and FX were limited. This was in terms of the different variables of study and time periods reviewed. Citing and referencing similar prior research studies constitutes the theoretical foundations which are of value for research.

It can be suggested that, while researchers can point to data, historical precedence and other facts to support arguments. Different researchers come to different conclusions about what kind of regulations and controls should be applied to various markets and results of outcomes. It can be suggested to run complex models incorporating as many macro-economic variables as possible and also to put the outcomes and recommendations into practice and evaluate results.

The quarterly data from the CBK was only available from the year 2006 to 2021. In this case, there were no databases for previous years from CBK. The period reviewed and findings are still reliable and valid despite limitation on analysis of whole population. In this case,

databases should be populated and updated, in the case of Kenya, quarterly databases on macro-economic variables since independence should be populated.

While there may be few studies previous studies on a similar topic, it is suggested that new research typologies can be established.

5.3 Conclusions

The outcomes depict that increment in interest rate reduced FX rate. This reflects a negative effect of interest rate on FX rate where there is an increment in the interest rate as measure by lending rate. The study found that interest rate has a negative impact on FX rate in Kenya. This shows that increased lending rates would reduce the FX rate in Kenya.

Further, increased inflation rate was found to increase FX rate insignificantly. Hence, inflation rate has a positive but insignificant effect on FX rate. This stipulates that increased inflation would have no significant effect on FX rate. This study concludes that inflation rate has no significant effect on FX rate in Kenya. Hence, inflation is not a determinant of FX in Kenya. If it increases optimally, the foreign exchange rate in Kenya would increase in the long run.

Similarly, increased GDP growth rate reduced FX but not substantially. This indicates that GDP growth rate reduces the FX in a country. The study thus concludes that GDP growth rate has no significant effect on the FX rate in Kenya. This means that it's not a key factor influencing the Kenyan FX rate measured by the KSh/USD. Also, GDP growth rate if increased optimally would lead to reduction in the FX in Kenya.

Further, increased money supply increase FX significantly, this is an indication that money supply had a positive effect on FX. Hence the conclusion was that money supply positively

influences FX in Kenya. This means that when the money supply increases the country experiences increased FX.

5.4 Recommendations

The outcomes depict that increment in interest rate reduced FX rate. This reflects a negative effect of interest rate on FX rate. The study concluded that interest rate has a negative effect on FX rate in Kenya. Therefore, increased interest rate in terms of lending rate would reduce the FX rate in Kenya. The government should come up with a policy that would increase the lending rate in Kenya. This would lead to decreased FX rate of the KSh to the dollar.

From the results, the investigation made a conclusion that inflation rate had no substantial effect on FX rate in Kenya. This is an insinuation that where the inflation rate in Kenya increases, the FX rate is not substantially affected. The government should focus on other macroeconomic factors in their policy making for reduced FX rate.

The research concludes that GDP growth rate has a negative insignificant effect on FX rate in Kenya. This implies that the GDP increase in Kenya would reduce the FX rate insignificantly. The state should formulate policies that will boost the GDP growth rate optimally for reduce FX rate in Kenya.

The outcomes led to a conclusion that money supply possesses a positive effect on FX rate in Kenya. Thus increased money supply in Kenya increases the Kenyan shilling FX rate against the dollar. There is need for the government to come up with policies that would reduce the money supply within the country hence reducing the rate at which the KSh exchanges with the USD.

5.5 Limitations of the Study

The investigator was faced by a limitation in relation to the credibility of data. The researcher could not verify credibility of data despite getting it from CBK which is the authorized regulator. The study adopted secondary data which is rather historical. To overcome this, researcher included most recent data of the year 2021. This study was limited by time available for data collection. This was overcome by having research assistants help gather data. This enabled researcher to meet the set timelines for data collection and report writing.

The study was limited by its focus on macroeconomic variables and FX in Kenya other than other variables influencing FX. The measures of the variables also limited the study in that there are other measures to the macroeconomic variables and FX. The period of focus (2006-2021) also created a limitation to the study. Adoption of data anchored on other periods may produce different outcomes.

5.6 Suggestions for Further Research

From the research, future studies could be done on different timespans other than the period considered in this research. There is need for a similar research based on other macroeconomic variables influencing FX rate of Kenya other than the ones considered in this research. Using different measures of FX rate, further research can be done similar to the current research.

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APPENDICES

Appendix I: Data Collection Sheet

Year	Quarter	Foreign exchange rate	GDP Growth Rate	Money Supply	Interest rate	Inflation rate
		%	%	KSh. M	%	%
1996	Q1					
	Q2					
	Q3					
	Q4					
1997	Q1					
	Q2					
	Q3					
	Q4					

2021	Q1					
	Q2					
	Q3					
	Q4					

Appendix II: Research Data

Year	Quarter	Foreign exchange rate %	GDP %	Money Supply KSh. M	Interest rate %	Inflation rate %
2006	Q1	97.35	5.80	569600.00	13.27	6.71
	Q2	103.55	6.10	599368.00	13.75	6.53
	Q3	73.22	6.90	623544.00	13.63	6.35
	Q4	72.62	6.30	646718.00	13.89	6.06
2007	Q1	89.92	7.10	664853.00	13.66	5.37
	Q2	91.94	8.90	693701.00	13.28	4.75
	Q3	68.99	6.30	725818.00	13.07	3.93
	Q4	67.47	7.00	754176.00	13.32	5.10
2008	Q1	74.88	1.10	807556.00	13.89	7.71
	Q2	77.64	2.20	848008.00	13.99	11.82
	Q3	65.40	2.60	855074.00	13.74	16.17
	Q4	68.65	2.50	891570.00	14.44	18.14
2009	Q1	70.75	6.40	900498.00	14.77	17.05
	Q2	69.21	1.90	935889.00	14.88	13.68
	Q3	78.29	1.90	981520.00	14.76	9.98
	Q4	77.03	2.60	1024697.00	14.80	6.89
2010	Q1	73.39	4.80	1086504.00	14.92	5.34
	Q2	71.86	6.10	1160438.00	14.48	4.26
	Q3	78.86	6.00	1224547.00	14.15	3.56
	Q4	80.34	5.60	1261646.00	13.89	3.74
2011	Q1	78.17	5.10	1305511.00	13.96	5.64
	Q2	78.34	3.50	1355674.00	13.90	9.39
	Q3	87.37	4.00	1444592.00	14.42	13.66
	Q4	90.61	5.00	1505853.00	17.92	16.91
2012	Q1	81.16	3.50	1509222.00	20.05	17.29
	Q2	83.65	4.40	1564306.00	20.21	14.86
	Q3	84.16	5.00	1641032.00	20.00	10.33
	Q4	84.43	5.50	1723781.00	18.32	6.19
2013	Q1	83.39	6.10	1756644.00	17.90	4.21
	Q2	85.49	4.30	1830291.00	17.43	4.07
	Q3	86.03	6.40	1872806.00	16.95	5.77
	Q4	86.31	5.40	1964886.00	16.96	6.78
2014	Q1	84.66	5.20	2054901.00	17.00	7.24
	Q2	86.42	6.00	2145172.00	16.68	6.94
	Q3	87.21	4.60	2243258.00	16.40	6.75
	Q4	88.26	5.60	2303108.00	15.98	6.67
2015	Q1	86.58	5.80	2393719.00	15.62	6.31
	Q2	88.02	5.90	2511968.00	15.57	6.45
	Q3	96.04	6.10	2567505.00	16.08	6.44
	Q4	100.33	5.50	2661019.00	17.35	7.00
2016	Q1	90.75	5.30	2683630.00	17.93	6.81
	Q2	92.87	6.20	2769771.00	18.15	6.75

	Q3	101.46	5.20	2791347.00	16.54	6.20
	Q4	101.38	7.20	2800571.00	13.69	6.16
2017	Q1	96.52	5.20	2816589.00	13.65	7.66
	Q2	98.08	4.40	2931289.00	13.66	8.61
	Q3	103.03	4.50	2990227.00	13.68	8.85
	Q4	103.19	5.30	3015284.00	13.68	6.92
2018	Q1	100.59	6.20	3028338.00	13.61	5.25
	Q2	101.37	6.00	3159841.00	13.24	4.32
	Q3	101.49	6.40	3266532.00	12.85	4.72
	Q4	101.21	6.00	3293292.00	12.56	5.23
2019	Q1	101.64	5.50	3364361.00	12.49	5.25
	Q2	101.89	5.30	3461618.00	12.48	5.25
	Q3	101.70	5.10	3482767.00	12.44	4.63
	Q4	102.12	5.70	3501181.00	12.35	5.12
2020	Q1	101.56	4.90	3594689.00	12.19	5.16
	Q2	102.71	-5.70	3779578.00	11.92	5.42
	Q3	105.13	-1.10	3864966.00	11.88	4.88
	Q4	107.70	1.20	3955321.00	12.00	4.80
2021	Q1	103.52	2.00	4021955.00	12.02	5.24
	Q2	104.17	11.90	4072752.00	12.05	5.95
	Q3	109.20	9.90	4195247.00	12.10	6.38
	Q4	109.77	7.30	4226713.00	12.14	6.32