

**AN INVESTIGATION OF THE RELATIONSHIP BETWEEN INTEREST RATE  
AND INFLATION IN KENYA**

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## DECLARATION

This project is my original work and has not been submitted for a degree in any other university.

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This project has been submitted with my approval as the University Supervisor.

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## **DEDICATION**

This work is dedicated to my family

## **ABSTRACT**

Changes in interest rate have considerable effects on decision making of economic agents and therefore it is one of the main policy variables in macroeconomics. Various factors have influence on interest rate and one of them is inflation rate. Theoretical and empirical studies have mixed results on the relationship between these two variables and therefore provide a fruitful area for further research for developing countries such as Kenya. This study therefore sought to assess the causality between these two variables and the relationship between them.

The study used a correlational design. Secondary data was drawn from the Kenya Bureau of Statistics and the Central Bank of Kenya websites from 1961 – 2011 on interest rate, inflation rate, money supply, and GDP growth rates. Analysis was performed using descriptive analysis, Granger-causality tests, correlation analysis, and regression analysis. This was done through STATA software.

On the causal relationship between interest rate and inflation rate, the study found a unidirectional relationship which ran from inflation to interest rate ( $p < 0.05$ ). With the direction of relationship examined, a further analysis was run to examine whether inflation rate significantly influenced interest rate. The study revealed that inflation rate did not have a significant impact on interest rate ( $p > 0.05$ ). The results further showed that GDP growth has a negative and significant impact on interest rates in Kenya ( $p < 0.05$ ) while money supply had a positive and significant impact on interest rate ( $p < 0.01$ ). The study concludes that there is a unidirectional relationship that runs from inflation to interest rates. The study further concludes that inflation does not have significant effect interest rates but GDP growth and money supply have a significant impact on interest rates in Kenya.

The study recommends that in controlling the interest rates in Kenya, the Central Bank alone through the use of base lending rates is not enough as evidence suggests that the levels of money supply as well as the GDP growth rates are important determinants of interest rates in Kenya. Therefore, policy makers must expand the variables they need to control for the interest rates to be kept at levels that can encourage borrowing.

# TABLE OF CONTENTS

<b>DECLARATION.....</b>	<b>i</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>ii</b>
<b>DEDICATION.....</b>	<b>iii</b>
<b>ABSTRACT.....</b>	<b>iv</b>
<b>LIST OF TABLES.....</b>	<b>vii</b>
<b>LIST OF FIGURES.....</b>	<b>viii</b>
<b>ABBREVIATION.....</b>	<b>ix</b>
<b>CHAPTER ONE.....</b>	<b>1</b>
<b>INTRODUCTION.....</b>	<b>1</b>
1.1    Background of the Study.....	1
1.2    Research Problem.....	4
1.3    Research Objectives.....	5
1.4    Value of the Study.....	6
<b>CHAPTER TWO.....</b>	<b>7</b>
<b>LITERATURE REVIEW.....</b>	<b>7</b>
2.1    Introduction.....	7
2.2    Theoretical Literature.....	7
2.3    Empirical Review.....	15
<b>CHAPTER THREE.....</b>	<b>19</b>
<b>RESEARCH METHODOLOGY.....</b>	<b>19</b>
3.1    Introduction.....	19
3.2    Research Design.....	19
3.3    Sampling Design.....	19
3.4    Data Collection.....	20
3.5    Data Analysis.....	20

<b>CHAPTER FOUR.....</b>	<b>22</b>
<b>DATA ANALYSIS, RESULTS AND DISCUSSION.....</b>	<b>22</b>
4.1 Introduction .....	22
4.2 Descriptive Analysis .....	22
4.3 Granger Causality Test results .....	25
4.4 Correlation and Regression Results .....	26
4.5 Discussion of Findings .....	27
<b>CHAPTER FIVE .....</b>	<b>29</b>
<b>SUMMARY, CONCLUSION AND RECOMMENDATIONS .....</b>	<b>29</b>
5.1 Introduction .....	29
5.2 Summary .....	29
5.3 Conclusion.....	30
5.4 Limitations of the Study.....	31
5.5 Recommendations for Policy and Practice.....	31
5.6 Areas for Further Research .....	32
<b>REFERENCES.....</b>	<b>33</b>
<b>APPENDICES.....</b>	<b>36</b>
Research Data .....	36

## LIST OF TABLES

Table 1:	Summary Statistics .....	22
Table 2:	Causality between inflation and interest rates in Kenya.....	26
Table 3:	Correlation Matrix for all variables in the model.....	26
Table 4:	Relationship between inflation and interest rates in Kenya .....	27

## LIST OF FIGURES

Figure 1: Trend of Inflation Rate in Kenya.....	23
Figure 2: Trend of Interest Rate in Kenya .....	24
Figure 3: Trend of GDP Growth in Kenya.....	24
Figure 4: Trend of Money Supply in Kenya .....	25

## **ABBREVIATION**

CBK	Central Bank of Kenya
GDP	Gross Domestic Products
RBD	Real Bills Doctrine

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Background of the Study**

The existing macroeconomic theories can be applied to study the relationship between interest rate and inflation rate. According to literature, when the price level is increased, firstly the real balances will be affected. In other words, the higher price level is a cause for lower real supply of money. Decreased real money supply distorts whole economy. This means disequilibrium. In the next phase, the supply of bonds is increased. The result is a lower price for bonds and higher interest rate. Therefore, there is a positive causal relationship from inflation rate to nominal interest rate. In other words, increased inflation rate provides some increases in interest rate.

#### **1.1.1 Relationship between Interest Rates and Inflation**

An interest rate is the rate at which interest is paid by a borrower for the use of money that they borrow from a lender (Brealey et al, 2001). The interest rates and price changes are important variables in the macro-economy that are often monitored by economists and policy makers. The relationship between these variables has been subject to substantial research. Most of this research has focused on the influence of prices on the interest rate (Wilcox, 1983). Only a few studies have considered the impact of changes in the interest rate on price (Barsky and DeLong, 1991). Despite intensive empirical studies and an extensive literature, the results of these studies have been contradictory and confusing. This contradiction is attributed, in part, to the complexity of the theoretical channels that explain the impact of the interest rate on price (Kandil, 2005).

Inflation rate is defined as the rate at which prices generally increase (Brealey et al., 2001). Inflation is intensely undesired. A high rate of inflation is considered as one of the most important problems facing a country. The basic reason for adopting price stability as the primary object of monetary policy is to create a stable and non-inflationary environment for resource allocation and to stabilize price expectations. Maintaining low inflation is seen as a necessary part of an effective anti-poverty strategy.

The influence mechanism of interest rate on inflation can be explained in various ways. One method is to apply user cost of capital. The increased interest rate raises the user cost of capital (Branson, 1979) that results in higher production costs. This changes raise inflation by shifting the aggregate supply curve to the left side. In addition, the changing interest rate affects inflation through influencing the money volume. In the endogenous money models which money supply is a function of interest rate, the money supply is increased when interest rate goes up. Therefore, according to quantity theory of money, the more money supply results in inflation in the short- and long-run.

Although money supply has not significant effect on inflation in the recession period, however the impact of money supply on inflation is positive and significant in the medium- and long- run in normal conditions. The relationship between nominal and real interest rates indicates a positive relationship between inflation rate and nominal interest rate. This debate has presented by William Douglas before 1840s. Then, Henry Thornton used this idea for explaining the nominal and real interest rates relationship. Marshal (1890) has introduced the relationship between nominal interest rate and inflation rate.

Clark (1895) believes in fixed real interest rate. In his view, nominal interest rate should be changed proportional with inflation rate. Irving Fisher (1896) explained theory of inflation and interest systematically.

Booth and Ciner (2001) have studied the relationship between interest rate and inflation rate using co integration in 9 European countries and U.S. The conclusion supports the long-run relationship except for one case. Brazoza and Brzezina (2001); and Fave and Auray (2002) have confirmed a relationship between interest rate and inflation rate in the long run.

### **1.1.2 Interest Rates and Inflation in Kenya**

Over the past few years, there has been volatility on the bank lending rates in Kenya. This has been occasioned by the actions of the Central Bank of Kenya (CBK). When the CBK reduced its base lending rates to commercial banks in 2010, commercial banks reduced their lending rates to customers and this saw many people taking up loans in order to take advantage of the low bank lending rates. The banks were literally hawking loans to customers. However, towards the end of 2011, when faced with high volatility on the foreign exchange rates, the CBK rescinded its move and increased the base lending rates to commercial banks. This saw a rise in bank lending rates. During the same period, inflation rates moved from 6.54 when interest rates were 13.92 to close the year at 18.93 when the interest rates were at 20.04. From this, it can be deduced that interest rates may have influenced the inflation rates over the period – or vice versa.

## **1.2 Research Problem**

Since the changes in interest rate have considerable effects on decision making of economic agents, it has been one of the main policy variables in macroeconomics; and it has attracted the attention of economic agents and participants to itself. On the other hand, various factors have influence on interest rate. One of the basic macroeconomic variables related with interest rate is inflation rate. Based on theoretic issues and empirical studies, there is bidirectional causality relationship between interest rate and inflation rate. Asgharpur et al. (2007) reported that some studies have rejected a strong bidirectional relationship between two-mentioned variables. The economic theories indicate that increased inflation rate gives rise to higher interest rate.

Interest rates lie at the centre of monetary policy, not just as passive reflectors on money supply but rather as one of the main policy instruments. Interest rates have played a central role macroeconomic policy. In developing countries, interest rates have also enjoyed high popularity as policy instruments. For instance, high interest rate has been an essential component of many stabilization programs in countries with chronic inflation during the 1980s (Asgharpur et al. 2007). The interest rates have been fluctuating in Kenya with the Central Bank of Kenya changing the base lending rates to commercial banks hence changing the bank interest rates. On the other hand, the inflation rates have also been moving up and down. This calls for a study on the same to ascertain whether the interest rates and inflation in Kenya concur with the theory that they relate.

A study by Asgharpur et al. (2007) on the causal relationship between the interest rate and inflation rate showed a unidirectional causality from interest rate to inflation rate in

40 Islamic countries. Darby (1975), Feldstein (1976), Mundel (1963), Tobin (1965), Nelson & Schewert (1977), Mishkin (1981, 1988) and Gibson (1982) have verified positive relationship between inflation rate and interest rate. On the other hand, Barsky (1987), Huizinga & Mishkin (1986), Mishkin (1992) and Ghazali (2003) have concluded that there is no strong relationship between interest rate and inflation rate. These studies therefore reveal that there is still no consensus on whether there is a relationship and if so the direction of that relationship. A number of studies have also been carried out on the effects of interest. For example, Kipnetich (2011) and Gitonga (2010) studied the relationship between interest rates and performance of commercial banks in Kenya. On the other hand, studies on inflation rate include Wamucii (2010) on the relationship between inflation and financial performance of commercial banks; Nyambok (2010) on the relationship between inflation rates and liquidity of commercial banks; and Nyamute (1998) on the relationship between inflation rate, money treasury bills rate and exchange rates. None of these studies have attempted to examine the relationship between interest rate and inflation rate in Kenya. This study attempted to fill in this gap. The research question was: what is the relationship between interest rate and inflation rate in Kenya?

### **1.3 Research Objectives**

The objectives of this study were:

1. To assess the causality between interest rate and inflation rate in Kenya.
2. To establish the relationship between interest rate and inflation in Kenya.

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

This study is of significance to the Government of Kenya. This is because the study will show if the inflation rate is significantly influenced by the interest rates. The Government can therefore make policy decisions regarding how to control the inflation rate in Kenya.

This study is also important to theory of public finance as it contributes to the theory by focusing on the determinants of inflation rate especially in developing countries like Kenya. It specifically sheds more light on the role of interest rates on inflation.

The study is also important to researchers and academicians as it will be a useful guide for future researchers interested in undertaking a study on the determinants of inflation rate in a developing economy like Kenya.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter looks at previous literature that relates to the subject of study. It is organized as follows: Section 2.2 discusses the theories of inflation under the theoretical literature while section 2.3 talks about the effects and determinants of inflation through the empirical review of literature. The chapter closes with a discussion of the gap in knowledge.

#### **2.2 Theoretical Literature**

There is a great deal of economic literature concerned with the question of what causes inflation and what effect it has. There are different schools of thought as to the causes of inflation. These can be divided into two broad categories: quality theories of inflation and quantity theories of inflation. The quality theory of inflation rests on the premise of a seller accepting currency to be able to exchange that currency later for goods that are desirable as a buyer. The quantity theory of inflation hinges on the quantity equation of money that relates the money supply, its velocity, and the nominal value of exchanges.

Currently, the quantity theory of money is widely accepted as an accurate model of inflation in the long run. Consequently, there is now consensus among economists that in the long run, the inflation rate is essentially dependent on the growth rate of money supply. However, in the short and medium term inflation may be affected by supply and demand pressures in the economy, and influenced by the relative elasticity of wages, prices, and interest rates.

According to Wennerlind (2005), the question of whether the short-term effects last long enough to be important is the central topic of debate between monetarist and Keynesian economists. Gordon (1988) argues that in monetarism prices and wages adjust quickly enough to make other factors merely marginal behavior on a general trend-line while in the Keynesian view, prices and wages adjust at different rates, and these differences have enough effects on real output to be "long term" in the view of people in an economy.

### **2.2.1 Keynesian View**

Keynesian economic theory avows that changes in money supply do not directly have an effect on prices, and that noticeable inflation is the consequence of pressure in the economy expressing themselves in prices. According to Gordon (1988), there are three major types of inflation, or what he commonly refers to as the "triangle model."

Demand-pull theory states that the rate of inflation accelerates whenever aggregate demand is increased beyond the ability of the economy to produce (its potential output). Hence, any factor that increases aggregate demand can cause inflation. O'Sullivan and Sheffrin (2003) argue that in the long run, aggregate demand can be held above productive capacity only by increasing the quantity of money in circulation faster than the real growth rate of the economy. Gordon (1988) offers that demand inflation is beneficial to a rapid economic growth in view of the fact that the excess demand and favourable market conditions will stimulate investment and expansion.

Cost-push inflation, also called "supply shock inflation," is a consequence of a drop in aggregate supply. This may be because of natural disasters, or increased prices of inputs. For example, a sudden decrease in the supply of oil, leading to increased oil prices, can cause cost-push inflation. Producers for whom oil is a part of their costs could then pass this on to consumers in the form of increased prices (Gordon, 1988).

Built-in inflation is induced by adaptive expectations, and is often linked to the "price/wage spiral". Gordon(1988) suggests that it involves workers trying to keep their wages up with prices (above the rate of inflation), and firms passing these higher labour costs on to their customers as higher prices, leading to a 'vicious circle'. He says that built-in inflation reflects events in the past, and so might be seen as hangover inflation.

The effect of money on inflation is most obvious when governments finance spending in a crisis, such as a civil war, by printing money excessively. This sometimes leads to hyperinflation, a condition where prices can double in a month or less. According to O'Sullivan and Sheffrin (2003), money supply play a major role in determining moderate levels of inflation, although there are differences of opinion on how important it is. For example, Monetarist economists believe that the link is very strong; Keynesian economists, by contrast, typically emphasize the role of aggregate demand in the economy rather than the money supply in determining inflation. That is, for Keynesians, the money supply is only one determinant of aggregate demand.

Some Keynesian economists also disagree with the notion that central banks fully control the money supply, arguing that central banks have little control, since the money supply adapts to the demand for bank credit issued by commercial banks. This is known as the theory of endogenous money, and has been advocated strongly by post-Keynesians as far back as the 1960s. It has today become a central focus of Taylor rule advocates. This position is not universally accepted – banks create money by making loans, but the aggregate volume of these loans diminishes as real interest rates increase. Thus, central banks can influence the money supply by making money cheaper or more expensive, thus increasing or decreasing its production (O’Sullivan and Sheffrin, 2003).

A fundamental concept in inflation analysis is the relationship between inflation and unemployment, called the Phillips curve. This model suggests that there is a trade-off between price stability and employment. Blanchard and Galí (2007) suggest that some level of inflation could be considered desirable in order to minimize unemployment. 1970s. Modern macroeconomics describes inflation using a Phillips curve that shifts because of such matters as supply shocks and inflation becoming built into the normal workings of the economy. Blanchard and Galí (2007) therefore suggest that the Phillips curve represents only the demand-pull component of the triangle model.

Coe (1984) looks at another concept known as the potential output, which is a level of GDP, where the economy is at its optimal level of production given institutional and natural constraints. If GDP exceeds its potential, the theory says that inflation will accelerate as suppliers increase their prices and built-in inflation worsens. If GDP falls

below its potential level, inflation will decelerate as suppliers attempt to fill excess capacity, cutting prices and undermining built-in inflation. However, one problem with this theory for policy-making purposes is that the exact level of potential output is generally unknown and tends to change over time. Inflation also seems to act in an asymmetric way, rising more quickly than it falls.

### **2.2.2 Monetarist View**

According to Paul (2000), the most important factor affecting inflation or deflation is how fast the money supply grows or shrinks. They consider fiscal policy, or government spending and taxation, as ineffective in controlling inflation. Monetarists aver that the empirical study of monetary history shows that inflation has always been a monetary phenomenon. The quantity theory of money, simply stated, says that any change for money in a system will change the price level.

Monetarists assume that the velocity of money is unaffected by monetary policy (at least in the long run), and the real value of output is determined in the long run by the productive capacity of the economy. Mankiw (2002) says that under these assumptions, the primary driver of the change in the general price level is changes in the quantity of money. With exogenous velocity, the money supply determines the value of nominal output. He says that in practice, velocity is not exogenous in the short run, and so the formula does not necessarily imply a stable short-run relationship between the money supply and nominal output. However, in the long run, changes in velocity are assumed to be determined by the evolution of the payments mechanism. If velocity is relatively unaffected by monetary policy, the long-run rate of increase in prices (the inflation rate)

is equal to the long run growth rate of the money supply plus the exogenous long-run rate of velocity growth minus the long run growth rate of real output.

### **2.2.3 Rational Expectations Theory**

Rational expectations theory holds that economic actors look rationally into the future when trying to maximize their well-being, and do not respond solely to immediate opportunity costs and pressures. In this view, while generally grounded in monetarism, future expectations and strategies are important for inflation as well.

According to Hanish (2005), a core assertion of rational expectations theory is that actors will seek to "head off" central-bank decisions by acting in ways that fulfill predictions of higher inflation. This means that central banks must establish their credibility in fighting inflation, or economic actors will make bets that the central bank will expand the money supply rapidly enough to prevent recession, even at the expense of exacerbating inflation. Thus, if a central bank has a reputation as being "soft" on inflation, when it announces a new policy of fighting inflation with restrictive monetary growth economic agents will not believe that the policy will persist; their inflationary expectations will remain high, and so will inflation. On the other hand, if the central bank has a reputation of being "tough" on inflation, then such a policy announcement will be believed and inflationary expectations will come down rapidly, thus allowing inflation itself to come down rapidly with minimal economic disruption.

#### **2.2.4 Austrian View**

The Austrian School state that inflation is an increase in the money supply, rising prices are merely consequences and this semantic difference is important in defining inflation. Shostak (2000) says that Austrians stress that inflation affects prices in various degree, i.e. that prices rise more sharply in some sectors than in other sectors of the economy. He says that the reason for the disparity is that excess money will be concentrated to certain sectors, such as housing, stocks, or health care. Because of this disparity, Austrians argue that the aggregate price level can be very misleading when observing the effects of inflation. He declares that Austrian economists measure inflation by calculating the growth of new units of money that are available for immediate use in exchange, that have been created over time.

#### **2.2.5 Real Bills Doctrine**

Rothbard (2008) says that within the context of a fixed specie basis for money, one important controversy is between the quantity theory of money and the real bills doctrine (RBD). He says that within this context, quantity theory applies to the level of fractional reserve accounting allowed against specie, generally gold, held by a bank. Currency and banking schools of economics argue the RBD that banks should also be able to issue currency against bills of trading, which is “real bills that they buy from merchants. This theory was important in the 19th century in debates between "Banking" and "Currency" schools of monetary soundness, and in the formation of the Federal Reserve. Rothbard says that in the wake of the collapse of the international gold standard post 1913, and the move towards deficit financing of government, RBD has remained a minor topic, primarily of interest in limited contexts, such as currency boards discredited."

According to Timberlake (2005), the debate between currency, or quantity theory, and banking schools in Britain during the 19th century herald current questions about the credibility of money in the present. In the 19th century the banking school had greater influence in policy in the United States and Great Britain, while the currency school had more influence "on the continent", that is in non-British countries, particularly in the Latin Monetary Union and the earlier Scandinavia monetary union.

### **2.2.6 Anti-Classical or Backing Theory**

Baumol and Alan (2006) note that another issue associated with classical political economy is the anti-classical hypothesis of money, or "backing theory." The backing theory argues that the assets and liabilities of the issuing agency determine the value of money. Unlike the Quantity Theory of classical political economy, the backing theory argues that issuing authorities can issue money without causing inflation so long as the money issuer has sufficient assets to cover redemptions. Baumol and Alan say that there are very few backing theorists, making quantity theory the dominant theory explaining inflation.

### **2.2.7 Marxist Theory**

In Marxist, economics value is based on the labor required to extract a given commodity versus the demand for that commodity by those with money, this is according to Bresciani (2006). He says that the fluctuations of price in money terms are inconsequential compared to the rise and fall of the labor cost of a commodity, since this determines the true cost of a good or service. In this, Marxist economics is related to other "classical" economic theories that argue that monetary inflation is caused solely by

printing notes in excess of the basic quantity of gold. However, Marx argues that the real kind of inflation is in the cost of production measured in labor. Bresciani says that because of the classical labor theory of value, the only factor that is important is whether more or less labor is required to produce a given commodity at the rate, it is demanded.

### **2.2.8 Supply-Side Economics**

Supply-side economics holds that inflation is a consequence of either an increase in the supply of money or a decrease in the demand for balances of money. Frank (2005) offers that the inflation experienced during the Black Plague in medieval Europe was caused by a decrease in the demand for money, the money stock used was gold coin and it was relatively fixed, while inflation in the 1970s is regarded as initially caused by an increased supply of money that occurred following the U.S. exit from the Bretton Woods gold standard.

### **2.3 Empirical Review**

According to Asgharpur, Kohnehshahri, and Karami (2007), there is a unidirectional causality from interest rate to inflation rate in 40 Islamic countries. The findings have practical policy implications for decision makers in the area of macroeconomic planning particularly in Islamic countries. The results imply that banks must reduce interest rate to decrease the inflation.

Backman (2011) empirically investigates if the real interest rate negatively affects commodity prices and if they exhibit overshooting characteristics, using the Euro real interest rate as a proxy for world interest rate. This is analysed by means of a VAR

model, by which the output is used to specify impulse responses and variance decompositions. The findings show that the Euro real interest rate negatively affects commodity prices over the medium run.

A study by Ngugi and Kabubo (1998) to track down the financial liberalization process in Kenya and empirically tests for the interest rate determination in a liberalized market found that though emphasis in the literature on sequencing of financial reforms is first of all on achieving macroeconomic stability and other sectoral liberalization before financial liberalization, the process in Kenya showed that financial liberalization was followed by other reforms, including trade liberalization, Macroeconomic economic stability was not achieved before liberalizing interest rates. In addition, even immediately after the liberalization of interest rates, inflationary pressure was increasing, making it impossible to achieve real interest rates. The study further found that the spread between lending and deposit rates widened with liberalization, while the short-term rates increased at a faster rate compared with long-term rates resulting in a negatively sloped yield curve. The Treasury bill rate operated as the yardstick for short-term rates. Commercial banks increased deposit rates to compete for the deposits held by the nonbanking public.

A study by Ngugi and Wambua (2004) to analyse the structure of interest rates in the financial sector in Kenya found that except for the inter-bank and Treasury bill rates which are market determined, other money market interest rates are benchmarked to the Treasury bill rate; they are defined as Treasury bill rate plus a premium which reflect on monetary policy action, Inter-bank rate is lower than discount window rate but the

interbank market is more costly compared to the REPO market. This indicates a deliberate effort by the Central Bank of Kenya to maintain its position as a lender of last resort, with the banks choosing the inter-bank market as a priority in their liquidity management. A significant relationship is indicated between the interest rates and the liquidity in the market, which implies that liquidity management has a significant influence on interest rates. All interest rates rise with the tightening of monetary policy and take a general downward trend as the monetary policy is relaxed. A clear unidirectional causality is also observed from the money market interest rates those of banking institutions.

A research conducted by Kiptui (2009) examines the oil price pass-through to inflation in order to inform monetary policy decisions. This research estimates a traditional Phillips curve to derive estimates of oil price pass-through to inflation in Kenya. It is shown that oil prices have been correlated with inflation. This correlation seems to have declined towards the early 90's but started to increase after trade liberalization. The estimation results indicate that changes in oil prices have had significant effects on inflation. Other findings are that inflation has been significantly influenced by exchange rate changes and changes in aggregate demand conditions as captured by the output gap. The measure of oil price pass-through to inflation is found to be 0.05 in the short-run and 0.10 in the long-run much lower compared to exchange rate pass-through of 0.32 in the short-run and 0.64 in the long run. It implies that a 10 per cent increase in oil prices leads to only 0.5 per cent increase in inflation in the short-run and 1 per cent in the long run. Oil price pass-through is therefore low and incomplete, consistent with findings in other studies.

Finally, a study by Durevall and Ndung'u (1999) to analyse the dynamics of inflation in Kenya found that the exchange rate, foreign prices, and terms of trade have long-run effects on inflation while money supply and interest rates only have short-run effects. The dynamics of inflation were also found to be influenced by food supply constraints.

These studies show there is indeed a causal relationship between interest rates and inflation. However, there is literature without any Kenyan studies on the subject matter. Further more of the studies done elsewhere; none looks at an in-depth analysis of the relationship between interest rates and inflation. This is the gap in knowledge that this study intends to bridge by looking at the extent of the relationship between interest rates and inflation and the direction of the relationship.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter presents the research methodology that was used in the study. The research design is presented in section 3.2 followed by the sampling design in section 3.3, the data collection in section 3.4 and data analysis in 3.5.

#### **3.2 Research Design**

Since this research sought to explain a casual relationship between interest rates and inflation in Kenya, a correlation research design was used. In the development of the research, a regression model was designed from secondary data giving annual figures of the dependent and independent variables in the model. The data was used to develop, and prove the reliability of the model hence assisted in the explanation of the relationship between interest rates and inflation. The annual inflation rates and interest rates were generated by the Kenya National Bureau of Statistics.

#### **3.3 Sampling Design**

A 51-year period between 1961 and 2011 was selected on which the research is based. The period between 1961 and 2011 was representative enough in analyzing the relationship that is present between the variables (interest rates and inflation). The period between 1961 and 2011 consisted of sample data that had undergone several phases like independence, attempted coup of 1982, economic recessions and recoveries, and post election violence in 2007.

### 3.4 Data Collection

Data collected for the research was from secondary sources mainly found in official government publications and other government departments like the Central Bank of Kenya and Kenya National Bureau of statistics. Secondary data was useful in building the model and conducting tests thereon. Annual data for nominal interest rates and for inflation from 1961 – 2011 were collected mainly from the Central Bank of Kenya.

### 3.5 Data Analysis

First, the study analysed the causality between interest rate and nominal inflation rate using the Granger causality test which is a vector autoregression (VAR) model application. Two tests were obtained from this analysis: the first examined the null hypothesis that the nominal interest rate does not Granger-cause inflation, and the second test examined the null hypothesis that the inflation does not Granger-cause the nominal interest rate. This research also set to investigate the relationship between interest rates and inflation in Kenya. This relationship was designed on a simple regression model assuming a linear relationship between the variables. The following mode was used:

$$Interest = \beta_0 + \beta_1 Inflation + \beta_2 Controls + \varepsilon.$$

Where

Inflation is the nominal inflation rate

Interest is the interest rate

Controls are control variables such as GDP and Money supply

$\beta_0$ ,  $\beta_1$  and  $\beta_2$  are referred to as the model parameters,

$\varepsilon$  is the probabilistic error term that accounts for the variability in *inflation* that cannot be explained by the linear relationship with.

The correlation coefficient was used to measure the linear association between two variables. The student t-test was conducted on the variables to determine the significance of the variables in the model (Anderson, Sweeney & Williams, 1994). Data was presented in tables, charts, and graphs.

## CHAPTER FOUR

### DATA ANALYSIS, RESULTS AND DISCUSSION

#### 4.1 Introduction

This chapter presents the results of the study and discussions thereof. Section 4.2 presents the results of descriptive analysis. Section 4.3 shows the results of regression analysis while section 4.4 presents a discussion of findings.

#### 4.2 Descriptive Analysis

Table 1 shows the summary statistics on the variables used in the study. The data ranged from 1961 – 2011. The interest rate had 41 observations with a mean of 16.7% and a standard deviation of 7.2%. The interest rate ranged from 9% to 36.2%. The results show that inflation rate had 51 observations that ranged from a low of -0.17% to 45.9% with a mean rate of 10.7% and a standard deviation of 8.7%. GDP growth had 51 observations that ranged from -10.6% to 17.9% with a mean of 1.3% and a standard deviation of 4.5%. Lastly, money supply (M3) had 35 observations and ranged from 30% to 51.8% of GDP. The mean M3 was 40.7% with a standard deviation of 4.9%.

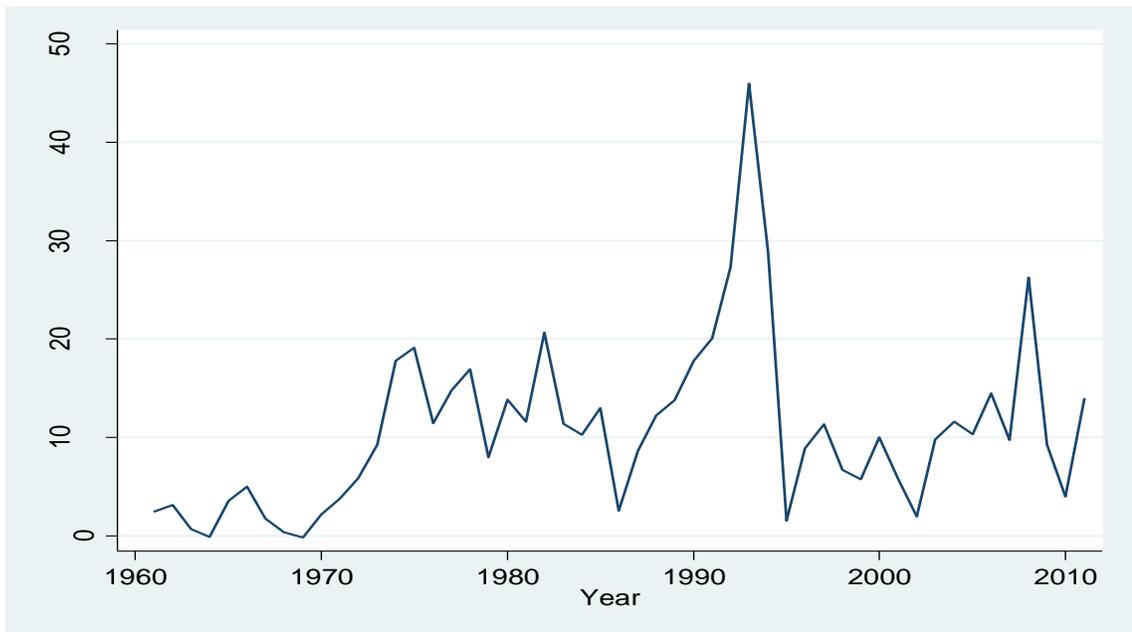
**Table 1: Summary Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	51			1961	2011
Interest Rate	41	16.72934	7.186026	9	36.24
Inflation Rate	51	10.69204	8.711071	-0.1715	45.97888
GDP growth	51	1.290338	4.524611	-10.5982	17.92928
Money Supply (M3)	35	40.74355	4.968001	30.0074	51.8577

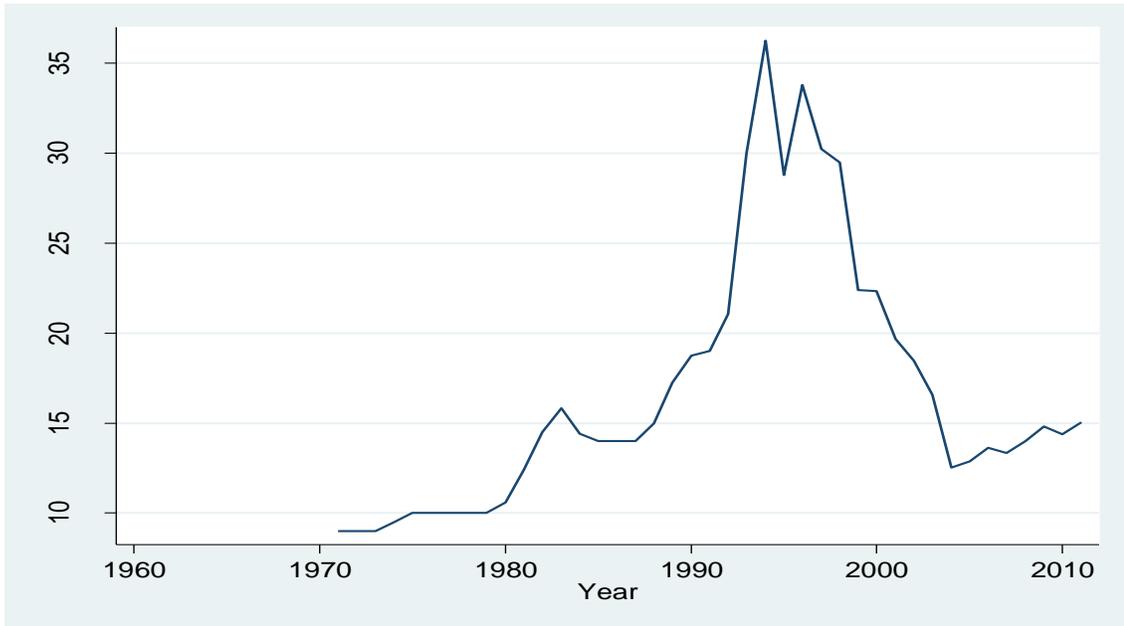
Figure 1 shows the trend of inflation from 1961 to 2011. As shown, there has been a high volatility of inflation over the period covered in the study. Figure 2 shows that interest

rates rose sharply in the 70s through 90s before sharply falling. However, there has been a steady rise in interest rates since 2004. Figure 3 shows that the GDP growth in Kenya over the years oscillated just above and below 0%. The money supply has also been volatile rising and falling then rising over the period of analysis as shown in Figure 4.

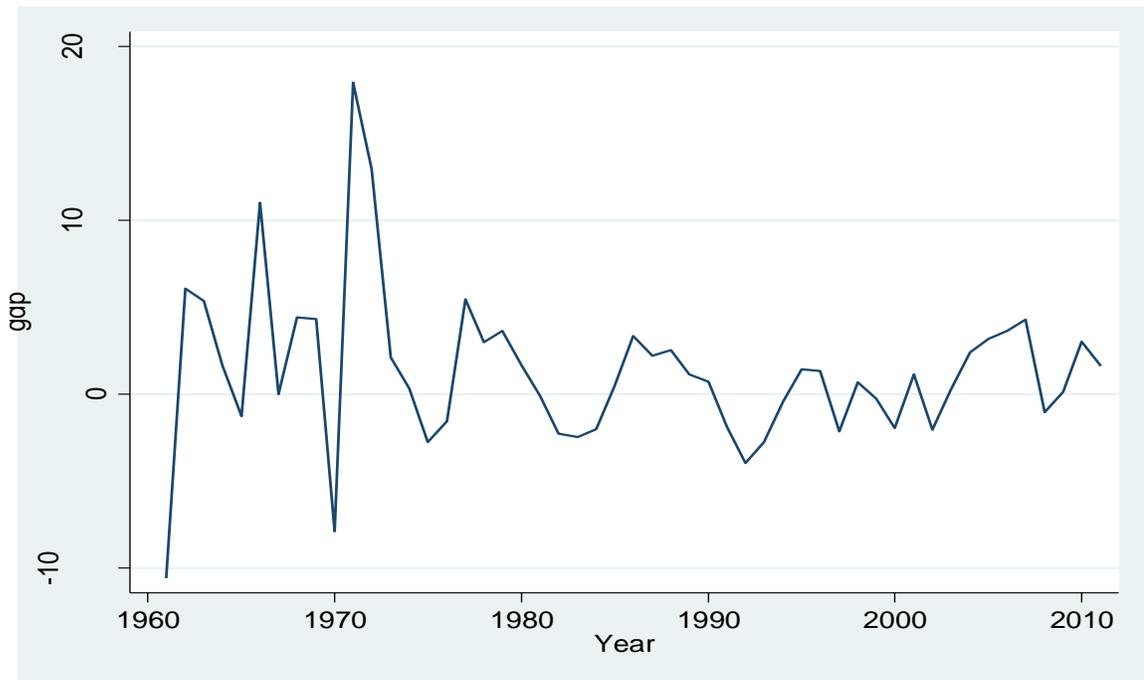
**Figure 1: Trend of Inflation Rate in Kenya**



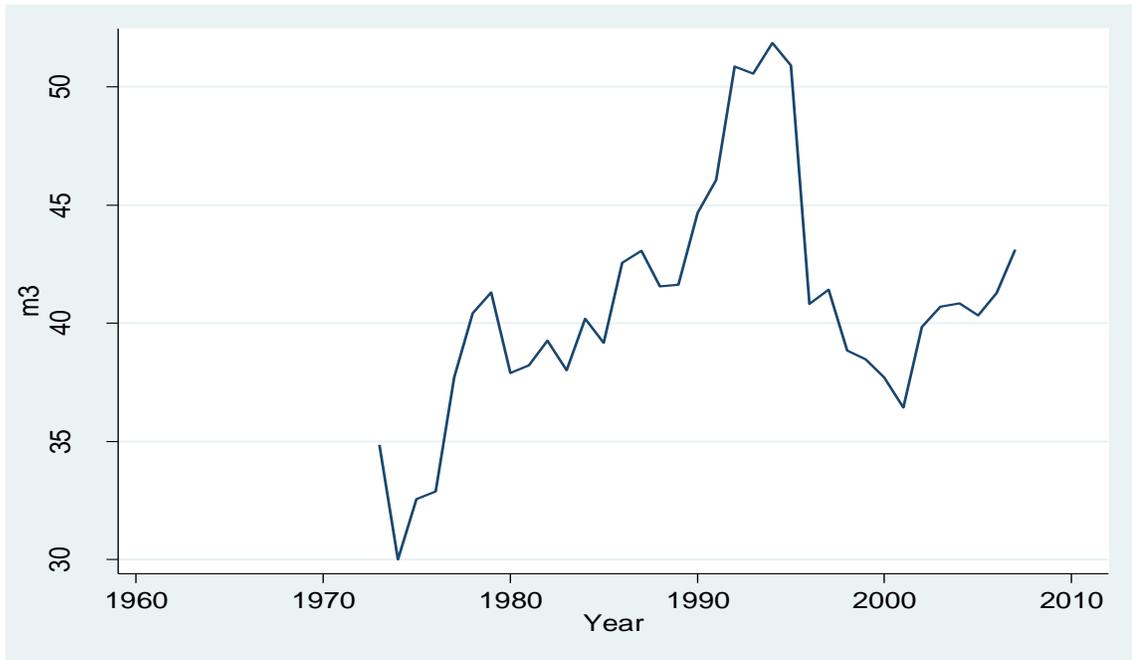
**Figure 2: Trend of Interest Rate in Kenya**



**Figure 3: Trend of GDP Growth in Kenya**



**Figure 4: Trend of Money Supply in Kenya**



### **4.3 Granger Causality Test results**

A granger causality test was run in order to establish the direction of the relationship between interest rate and inflation rate in Kenya. There are a number of statistical softwares that are usually used to calculate this test. In the present study, STATA was used to calculate the Walt test hence no formulations were necessary. The results of the Granger causality Walt test are shown in Table 2. As shown, the p-value for the effect of interest rate on inflation is more than 5%. Therefore, the null hypothesis that interest rate does not granger-cause inflation cannot be rejected. Thus, inflation is not granger-caused by interest rate. The results further show that the p-value for the effect of inflation on interest rate is less than 5%. The null hypothesis that inflation does not granger-cause interest rate is therefore rejected. This means that inflation granger-cause interest rates in Kenya.

**Table 2: Causality between inflation and interest rates in Kenya**

Equation	Excluded	Chi <sup>2</sup>	df	Prob>chi <sup>2</sup>
Inflation	Interest	1.1534	2	0.562
Inflation	ALL	1.1534	2	0.562
Interest	Inflation	10.885	2	0.004
Interest	ALL	10.855	2	0.004

#### 4.4 Correlation and Regression Results

Table 3 presents the correlation matrix with all the four variables used in the study. As the correlation matrix shows, inflation and money supply had a positive influence on interest rate while GDP growth had a negative effect. The essence of this correlation matrix was to test whether the independent variables highly correlated with one another (serial correlation). As shown, none of the independent variables were highly correlated with one another. There was therefore no serial correlation in the data which would lead to spurious results when an OLS regression is run.

**Table 3: Correlation Matrix for all variables in the model**

	Interest	Inflation	GDP growth	Money Supply
Interest	1			
Inflation	0.2028	1		
GDP Growth	-0.3428	-0.3834	1	
Money Supply	0.5882	0.3853	-0.0729	1

An OLS regression analysis was run using STATA software on a model based on the results from section 4.3 above. As had been noted, the relationship between inflation rate and interest rate ran from inflation rate to interest rate. Therefore, the model was estimated with interest rate as the dependent variable and inflation rate as the independent

variable while controlling for the effects of economic growth and money supply on interest rate. The results are presented in Table 3. As shown, model 1 shows the results without the control variables while model 2 shows the results of the regression with the control variables. The results show that in both occasions, inflation did not have a significant effect on interest rate at 5% level. The results further reveal that both control variables (GDP growth and Money Supply) significantly influenced interest rate as the results were significant at 1% level. Model 1 explained 5.4% of the variance in interest rate and model 2 explained 56% of the variance in interest rate as shown by the R-squared values.

**Table 4: Relationship between inflation and interest rates in Kenya**

Variables	Model 1		Model 2	
	Coef	SE	Coef	SE
Inflation	0.199	(0.134)	-0.161	(0.138)
GDP growth			-1.153**	(0.452)
Money Supply			0.952***	(0.217)
Constant	14.18***	(2.042)	-18.64**	(8.347)
Observations	41		35	
R-squared	0.054		0.460	

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 4.5 Discussion of Findings

The study shows that there has been a very high volatility in both interest and inflation rates since 1961 with interest rates hitting as low as 9% and as high as 36% while inflation rates hitting as low as -0.17% to as high as 45.9%. Other economic indicators such as GDP growth and money supply have also been volatile as the GDP growth hit the lowest point of -10% and the highest of 17.9%. On the other hand, money supply has ranged from 30% of GDP to 51% of GDP, maintaining a fairly average run of 40% of

GDP over the period of study. Within this period, Kenya's GDP has average 1.29% growth, way below the 10% mark to achieve Vision 2030. Interest rates have average 16% while inflation rate has averaged 10%. The graphical analysis confirms the volatility in these indicators.

The Granger-causality tests reveal that interest rate does not Granger-cause inflation rate but inflation rate Granger-cause interest rate. Thus, the direction of the relationship between inflation and interest rate runs from inflation to interest rate. This means that the relationship is unidirectional hence consistent with the findings of Asgharpur et al. (2007) in terms of the unidirectional nature of the relationship but differ with the same study as to the direction of such relationship. While the authors found a unidirectional relationship running from interest rate to inflation, the present study finds a unidirectional relationship that runs from inflation to interest rate.

The correlation results showed that there was no serial correlation between the predictors in the model hence enabling the running of an OLS regression analysis on the data. The regression results showed that inflation did not have a significant influence on interest rate. This is consistent with researchers such as Ghazali (2003) who found no strong relationship between interest rate and inflation rate. Therefore, although the relationship runs from inflation rate to interest rate, the specific effect of inflation rate on interest rate is not significant. However, GDP growth and money supply have a strong effect on the interest rate with money supply rising with rising interest rates and GDP growth falling with rising interest rates.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary of findings, conclusions made from the study, limitations of the study, recommendations for policy and practice, and areas for further research.

#### 5.2 Summary

The descriptive results showed that there has been a very high volatility in both interest and inflation rates since 1961 with interest rates hitting as low as 9% and as high as 36% while inflation rates hitting as low as -0.17% to as high as 45.9%. GDP growth and money supply have also been volatile as the GDP growth hit the lowest point of -10% and the highest of 17.9%. Money supply has ranged from 30% of GDP to 51% of GDP, maintaining a fairly average run of 40% of GDP over the period of study. Within this period, Kenya's GDP has average 1.29% growth. Interest rates have average 16% while inflation rate has averaged 10%.

The Granger-causality tests revealed that interest rate does not granger-cause inflation rate (p-value = 0.562) but inflation rate Granger-cause interest rate (p-value = 0.004). This means that the direction of the relationship between inflation and interest rate runs from inflation to interest rate. Therefore, the relationship is unidirectional. This is consistent with the findings of Asgharpur et al. (2007) in terms of the unidirectional nature of the relationship but differ with the same study as to the direction of such relationship.

The regression results showed that inflation had a positive but insignificant influence on interest rate ( $p > 0.05$ ) when no control variables were used in the model and a negative but insignificant impact on interest rate ( $p > 0.05$ ) when control variables were introduced. This is consistent with researchers such as Ghazali (2003) who found no strong relationship between interest rate and inflation rate. Therefore, although the relationship runs from inflation rate to interest rate, the specific effect of inflation rate on interest rate is not significant. On the other hand, GDP growth had a negative and significant effect on interest rate ( $p < 0.05$ ) while money supply had a positive and significant effect on the interest rate ( $p < 0.01$ ).

### **5.3 Conclusion**

The study concludes that the relationship between interest rate and inflation rate in Kenya is unidirectional and runs from inflation rate to interest rate. It is therefore inflation rate that causes fluctuations in interest rates and not vice versa.

The study further concludes that inflation rate does not have a significant influence on the interest rates in Kenya as the results failed significance tests. Therefore, the fluctuations in the inflation rates over the recent past have not had a major impact on the levels of interest rates in Kenya.

The study also concludes that GDP growth is a major determinant of interest rates in Kenya. As was noted, higher GDP growth rates lead to lower interest rates in Kenya while lower GDP growth rates lead to higher interest rates.

Finally, the study concludes that the level of money supply significantly affects the interest rates in Kenya. As the results show, higher money supply leads to higher interest rates while lower money supply leads to lower interest rates in Kenya.

#### **5.4 Limitations of the Study**

One major limitation of the study was the availability of monthly data as this was the initial plan for the study to use monthly data to perform the analysis. Since this was not possible, the researcher reverted to the use of annual data as this was readily available. The use of annual data meant that the number of observations was less than had been initially planned.

#### **5.5 Recommendations for Policy and Practice**

The study recommends that in controlling the interest rates in Kenya, the Central Bank alone through the use of base lending rates is not enough as evidence suggests that the levels of money supply as well as the GDP growth rates are important determinants of interest rates in Kenya. Therefore, policy makers must expand the variables they need to control for the interest rates to be kept at levels that can encourage borrowing.

The Central Bank of Kenya therefore needs to not only focus on the base lending rates but also on the levels of money supply as this is directly under its docket and therefore can determine appropriate levels for desired interest rates.

The Government should also ensure that the GDP growth rates improve annually so as to keep interest rates low and this will lead to enhanced economic activities in the country.

Keeping GDP growths above those envisaged in Vision 2030 can be a good start for the government of Kenya.

## **5.6 Areas for Further Research**

Studies need to explore this relationship further by using monthly data to examine the relationship between interest and inflation rates. This was a major limitation of the present study as the time did not allow the collection of monthly data and therefore use of such may enhance the reliability of results.

Further, studies should expand the list of control variables in order to gather more determinants of interest rates in Kenya as this may help inform policy makers on what factors they need to control to keep inflation and interest rates low.

There is also need to use a combination of both primary and secondary data in order to gather qualitatively the issues that may affect the levels of interest and inflation rates in Kenya as such methodologies have not been explored in this area.

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## APPENDICES

### Research Data

Year	Interest	Inflation	GDP Growth	Money Supply, M3
2011	15.05	14.02155	1.6240483	
2010	14.37	3.961389	3.0224186	
2009	14.80	9.234126	0.114204	
2008	14.02	26.23982	-1.034422	
2007	13.34	9.75888	4.2979968	43.11472
2006	13.64	14.45373	3.6349797	41.2705
2005	12.88	10.31278	3.1934724	40.33097
2004	12.53	11.62404	2.3878874	40.83619
2003	16.57	9.815691	0.260801	40.70405
2002	18.45	1.961308	-2.053781	39.84797
2001	19.67	5.738598	1.1188228	36.42718
2000	22.34	9.980025	-1.948143	37.70727
1999	22.38	5.742001	-0.266318	38.46242
1998	29.49	6.722437	0.6758902	38.85091
1997	30.25	11.36185	-2.139593	41.41846
1996	33.79	8.864087	1.3174973	40.81114
1995	28.80	1.554328	1.4260712	50.90791
1994	36.24	28.81439	-0.435276	51.8577
1993	29.99	45.97888	-2.768881	50.56382
1992	21.07	27.33236	-3.977346	50.87917
1991	19.00	20.0845	-1.879857	46.05778
1990	18.75	17.78181	0.718283	44.67306
1989	17.25	13.78932	1.1272012	41.63755
1988	15.00	12.26496	2.5184218	41.5591
1987	14.00	8.637673	2.1942266	43.06497
1986	14.00	2.534276	3.3267767	42.54948
1985	14.00	13.00657	0.4946075	39.1699
1984	14.42	10.2841	-2.006686	40.18479
1983	15.83	11.39778	-2.470294	38.01354
1982	14.50	20.66671	-2.294829	39.26761
1981	12.42	11.60305	-0.109684	38.22152
1980	10.58	13.85818	1.6586851	37.89742
1979	10.00	7.979353	3.6321498	41.31193
1978	10.00	16.93178	2.981536	40.42257
1977	10.00	14.82096	5.4500002	37.71173
1976	10.00	11.44903	-1.567449	32.87844
1975	10.00	19.12018	-2.774554	32.56317

1974	9.50	17.80995	0.3212557	30.0074
1973	9.00	9.281194	2.121773	34.8418
1972	9.00	5.831645	12.957768	
1971	9.00	3.780206	17.929281	
1970		2.188527	-7.915491	
1969		-0.1715	4.32879	
1968		0.366712	4.4072216	
1967		1.759196	-0.017812	
1966		5.014395	11.016762	
1965		3.578529	-1.259272	
1964		-0.0993	1.636231	
1963		0.697674	5.3661729	
1962		3.117506	6.0638815	
1961		2.457002	-10.5982	

**Source: KNBS website (2013), CBK website (2013), World Bank Database (2013)**