

**INFLUENCE OF MONETARY AND FISCAL  
POLICIES ON CONSTRUCTION OUTPUT LEVELS  
IN KENYA**

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**Influence of Monetary and Fiscal Policies on Construction Output  
Levels in Kenya**

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DECLARATION

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

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## **DEDICATION**

To my wife Margaret and my two daughters, Peace and Grace for praying for me to have peace and enough grace as I did this work.

To my aged parents, who stood with me throughout the preparation of this thesis.

To my God, for giving me enough strength, to carry out with this work tirelessly. Glory is to Him.

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## **LIST OF ABBREVIATIONS**

<b>ACF</b>	Autocorrelation Functions
<b>ADF</b>	Augmented Dickey Fuller
<b>AIC</b>	Advanced Industrialized Country
<b>CBK</b>	Central Bank of Kenya
<b>ESP</b>	Economic Stimulus Projects
<b>GDP</b>	Gross Domestic Product
<b>IMF</b>	International Monetary Fund
<b>IRR</b>	Internal Rate of Return
<b>KNBS</b>	Kenya National Bureau of Statistics
<b>LDC</b>	Less Developed Country
<b>MPC</b>	Monetary Policy Committee
<b>NIC</b>	Newly Industrialized Country
<b>PRGF</b>	Poverty Reduction and Growth Facility
<b>SAF</b>	Structural Adjustment Facility
<b>SNA</b>	System of National Accounts
<b>TDC</b>	Total Development Cost

## ABSTRACT

Construction output is a key indicator of the health of an economy and should therefore be well managed to enhance its functionality in the economy. However, in Kenya, empirical evidence on the influence of monetary and fiscal policies factors - such as interest rate, inflation rates, foreign exchange rates, tax rates and government spending on construction - is limited. This in turn limits the government's ability to manage construction output in the country. This report presents an empirical study showing objectively how fiscal and monetary factors actually affect construction output, and how these can be used as the basis for policy decisions on the management of the output.

In this study, the researcher aimed to investigate the influence of monetary and fiscal policy factors on construction output in Kenya. The study objectives were to describe the factors, to compute correlation coefficients amongst the stationary series of the variables and to regress the construction output on the factors. Data for the study were obtained from Kenya National Bureau of Statistics and Central Bank of Kenya, and were time series in nature. The data were collected using a data sheet, and they cover a period of fourteen (14) years; year 2000 to year 2013, on quarterly basis.

The variables in the study were inflation rates, Kenya shilling per US dollar exchange rates, total tax on products, commercial banks' weighted interest rates, government expenditure on construction and construction output. The data analysis involved graphical analysis, tests of stationarity and regression analysis.

Construction output was regressed on the explanatory variables, applying the first differences of monetary policy factors and natural logarithms of the first differences of fiscal policy factors.

It was observed that the explanatory variables had no significant influence on construction output of the country's construction industry in the current quarter. A model describing this relationship was developed which has a coefficient of

determination ( $R^2$ ) of 0.11. This value shows that the regression model has low explanatory powers and hence it was not logical to conclude that the factors had influence on construction output in Kenya in the current quarter. However, it is clear that the impacts of these factors are usually felt by the industry much later after the policies' implementation. This is demonstrated by a regression model of lagged explanatory variables which has a coefficient of determination ( $R^2$ ) of 0.21 which included lags up to the 12<sup>th</sup> lag.

On the basis of these results, it is concluded that the monetary and fiscal policy factors can be used as effective policy instruments to control and manage construction sector in Kenya. It is recommended that construction sector experts and stakeholders should ensure construction projects, especially those taking more than two years are properly appraised and all these monetary and fiscal factors are well captured in the feasibility study and appraisal.



## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background of the Problem**

The construction industry's main role is provision of physical constructed facilities to give other activities space for taking place. Hillebrandt, (2000) observed that the value in monetary terms of *all the buildings and civil engineering works* in the industry produced within a given duration of time, usually a calendar year, is said to be the construction industry's gross output. According to her, this output is about 10% on average, on the whole world's Gross National Product (GNP).

The industry in Kenya mostly maintains an upward trend in growth. Recently; 2013 and 2014, an economic survey report released by Kenya National Bureau of Statistics (KNBS) showed Kenya's building and construction as having contributed 4.8% to the Gross Domestic Product (GDP). The GDP rose from Kshs.4.73 trillion to Kshs.5.36 trillion in 2014 giving a nominal rise of 13.3% as seen in Macharia, (2015).

Fiscal and monetary policy factors cannot be overlooked when making decisions on construction projects. More importantly, these factors come out very strongly when deciding whether to undertake a construction project or not.

It is quite apparent that most of the construction projects are usually funded using borrowed funds as seen in Gruneberg, (1997) and Akintoye and Skitmore, (1994). The cost of these finances to the borrower is the interest rate charged by the lenders. Lending to construction and building sector in Kenya went up from Kshs.70.8 billion in 2013 to Kshs.80.4 billion in 2014. This was exhibited in the economic survey report released in April, 2015 by Kenya National Bureau of Statistics (KNBS) as reported in Macharia, (2015). This increment in borrowed funds by the construction sector according to Macharia, (2015) translates to 13.6%. This is a clear indication that construction sector to a large extent relies on borrowed funds

and hence Gruneberg, (1997) and Akintoye and Skitmore, (1994) are justified in their assertion.

Major construction projects especially those found in developing world are financed through foreign aid. A few projects that fall in this category here in Kenya include the Thika Super Highway, the Standard Gauge Railway line (SGR), The Konza City in Machakos, The Lamu Port-Southern Sudan Ethiopia corridor project (LAPSSSET) which connects the three countries, that is Kenya, Ethiopia and Southern Sudan. These projects are massive and mostly take quite a long duration to complete. This implies that in between the project commencement and the project completion, changes in monetary and fiscal policies are likely to negatively affect the projects. Whether this is likely or not likely to happen is the subject of this research.

The other major fact is that, construction materials' prices are subjected to taxes normally known as Value Added Tax (VAT) in Kenya. It was introduced in 1990 to replace sales tax which was operational in the country from 1973. Value added Tax (VAT) came into being through Value Added Tax Act, Cap. 476 of the Laws Kenya. Moreover, developers' funds are also subject to income tax and hence rendering them (developers) to low purchasing power.

In most economies, the government is a key player in construction sector and therefore, its spending in the sector makes a huge impact on its growth as well as keeping it active. Moreover, construction output plays a key role as a sector in an economy. The current government according to Oguda, (2015), though with limited space for fiscal choreography, it is keeping the infrastructure sector very vibrant through its own direct expenditure in the sector. This is particularly directed to roads. Oguda, (2015), also says that the estimated allocation to infrastructure sector in the 2015/2016 financial year is \$24.2M. This is a colossal amount which will push the infrastructure sector to great heights and it is even expected that the amount is going to increase with time as seen in Oguda, (2015). The breakdown of this allocation is given in page thirteen (13) of the budget statement delivered by

finance cabinet secretary, Henry Rotich for the 2015/2016 financial year. According to him, the allocation is mainly for road network in Kenya for enhancement of the economy's productivity and competitiveness. The on-going road construction work is allocated Kshs. 58.5 billion, Kshs. 26.7 billion for road maintenance, Kshs. 42 billion for foreign financed roads and Kshs. 5 billion for the Road Annuity Programme. The Konza Techno City project is also allocated Kshs. 0.8 billion.

From the foregoing, it is quite apparent that the government is going to continue funding/ financing infrastructure projects. But the big question that arises is how successful are these projects going to be given that a number of them have stalled in the past. A report which was released by the government's ministry of public works in 2005 indicates that all is not well as far as public projects are concerned. By the end of 2002 according to the report, 197 public building projects had stalled as found in Mutua, (2013). The reasons advanced for this mass failure of projects are quite varied. Mutua, (2013) outlines them as ranging from lack of adequate financial planning, projects not matching financial availability, budget cuts in the middle of financial year, economic recessions, inflation rates, variations and poor project management. Table 1.1 sheds more light as far as these stalled projects are concerned.

**Table 1.1: No. of Stalled Construction Projects**

	<b>1999</b>	<b>2003</b>
<b>No. of Stalled Projects</b>	164	207
<b>Accrued Expenditures (Kshs. In Billions)</b>	13.3	13.0
<b>Completion Cost (Kshs. In Billions)</b>	13.2	13.0
<b>Estimated original cost (Kshs. In Billions)</b>	31.4	26.0

**Source:** Public Expenditure Review, 2004

Keen analysis of all these reasons given to support stalling of public building projects, one starts seeing that all these problems can be summed up to a single reason; effects of monetary and fiscal policies. The table above paints this picture very clearly by showing the financial implications of stalled construction projects. This is the leverage of this study since it seeks to know how much do these factors contribute to the financial problems leading to stalling of many construction projects. Stalling of projects has many financial implications according to Mutua, (2013). This can also be seen in table 1.1.

Due to these facts, empirical evidence is very important to show the influence of monetary and fiscal policies factors, which may improve the governments' ability to manage and increase construction output in Kenya. Empirical evidence is needed to determine the extent to which these factors influence construction output in Kenya. Further past empirical work has not dealt specifically with all the monetary and fiscal policy factors. In this study, the influence of all these factors on construction output, are specifically targeted for investigation.

## **1.2 Statement of the Problem**

The problem under investigation in this study is the influence of fiscal and monetary policies on construction output in Kenya. The relationship between these policies and construction output in the country is at present not on the basis of proper scientific and empirical process. These relationships are expressed subjectively and therefore unreliable. Moreover, there is no evidence on how the monetary and fiscal policies have been affecting construction output in the country. And consequently, there is no tool already developed for the government to control and manage construction industry.

This research therefore, seeks to make a huge impact in contributing to offer some solutions to some of the economic problems facing this country by enabling the government to manage construction industry for continued increased activity. This shall also enable the country's economy to move towards the achievement of the vision of double digit growth in GDP as enshrined in the vision 2030.

Although a large number of empirical studies of the construction industry have been conducted, none of these studies has as its principal aim, the delineation of relationships between the use of monetary policy factors, fiscal policy factors and the output of the construction sector.

So far, generalizations about the relationship between these policy factors and the behavior of the construction industry can at best be termed "speculative". Literature has also shown that there is no prior research work on time series regression in relation to monetary and fiscal policy factors that touches on construction output in Kenya. Elsewhere, like in the UK, this has been done as seen in Bickerton and Gruneberg, (2013), but only on interest rates and construction output. In the country, time series regression models were developed in Mbiti, (2008) where construction output was explained by three variables. These were GDP, GNP and Misery Index – inflation and unemployment. Therefore, time series regression models of construction output on the monetary and fiscal factors that influence

construction output in Kenya is developed in this study.

### **1.3 Aim and Objectives**

The aim of this study was to investigate the influence of fiscal and monetary factors on construction output in Kenya for the purpose of using the factors as effective policy instruments to control and manage construction industry output in Kenya.

The specific objectives are:

1. To identify and describe the fiscal and monetary factors that influence construction output in Kenya.
2. To compute the coefficients of correlations amongst the stationary time series data of the variables and,
3. Regress construction output on the monetary and fiscal policy factors.

As amplified in Chapter II later, the fiscal and monetary factors are: commercial banks' weighted interest rates, inflation rate, exchange rates (Kshs per US\$), total tax collection from goods/products and government expenditure on construction. Monetary policy is one of the interventionist measures taken by the public for reasons of influencing the level and economic activity pattern in order to achieve certain desired goals as explained in Mudida (2009). This policy interacts a lot with fiscal policy as discussed in Njuru, (2012).

### **1.4 Hypothesis**

Construction output in Kenya is influenced by monetary and fiscal policy factors in the country. As stated before, the factors are interest rates, inflation rates, exchange rates, taxation and government expenditure on construction. This hypothesis was tested through the following regression equation:-

$$CO_t = \alpha + \beta_1 CBWR_t + \beta_2 IR_t + \beta_3 ER_t + \beta_4 TTP_t + \beta_5 GEC_t + \varepsilon_t \text{ (Source: Author, 2016)}$$

Where:

- $CO_t$  = Construction Output in a specific quarter
- $CBWR_t$  = Commercial Bank' Weighted Interest Rates in a specific quarter
- $IR_t$  = Inflation Rates in a specific quarter
- $ER_t$  = Kenya shilling per US dollar Exchange Rate in a specific quarter
- $GEC_t$  = Government Expenditure on Construction in a specific quarter
- $TTP_t$  = Total Tax on Construction in a specific quarter
- $\beta$  = Regression Coefficient
- $\varepsilon$  = Error Term or Residual
- $\alpha$  = Intercept (this is the value of  $CO_t$  when explanatory variables are set at zero)

The research hypothesis ( $H_1$ ) in the study is that  $\beta_i \neq 0$  for at least one of the regression coefficients, while the null hypothesis ( $H_0$ ) is that  $\beta_i = 0$ .

In this study, construction output (CO) is regressed on the explanatory variables, applying the logarithms of first differences of fiscal policy factors and the first differences of monetary policy factors.

This implies that construction output level in Kenya is explained or determined by fiscal and monetary policy factors. After regression, the negative coefficient of a variable implies that the variable has a negative effect on construction output. While a positive coefficient has an implication that the variable concerned has a positive contribution to construction output. The  $R^2$  value which is the coefficient

of determination shall inform how well the independent variables explain the dependent variable.

### **1.5 Study Justification & Significance**

The problem addressed in this research is the government's inability to effectively manage and control construction output through policy issues.

It has been seen especially in a report compiled by the Ministry of Public Works in 2005 that by the end of 2002, 197 public building projects had stalled. These are projects scattered all over the country. A substantial proportion of them amounting up to 43.7% of the projects stalled were said to be hospitals as well as health centers which pose a big social impact on the people of this country. According to the same Ministry of Public works, even as the government embarked on the plan to complete the stalled projects, many more continued to stall and towards the end of 2008, a number totaling 238 public building projects had stalled. This is a huge blow to the economy of this country due to the number of lost opportunities, amplified costs and also in loss of revenues. It is also important to note that the government is a key player in the sector. It is a general feeling that many projects fail due to lack of knowledge of the empirical interactions between activity in the construction sector and the major factors which are influential to it in Kenya. These fiscal and monetary factors have never been thoroughly discovered or investigated.

From this research thesis, experts and players in the construction industry are going to understand the impacts of monetary and fiscal policies factors on construction projects and hence be able to address them for smooth project management from inception to completion. This is definitely going to be a big plus to the economy of this country and the construction sector specifically.

## **1.6 Scope of the study**

The study looks at the influence of fiscal and monetary factors on construction output levels in Kenya. The monetary factors are inflation rate, Kenya shilling per US dollar exchange rate and commercial banks' weighted interest rate. The fiscal policy factors are total tax on products and government expenditure on construction. The monetary and fiscal factors are the independent variables and construction output in Kenya is the dependent variable.

## **1.7 Limitations**

The time series data of all the six variables were collected. The data were obtained from, Central Bank of Kenya (CBK) and Kenya National Bureau of Statistics(KNBS) which covered a period of fourteen (14) years. This is the period between 2000 and 2013.

## **1.8 Assumptions of the study**

The study made the following assumptions that:

All the rates and construction output values from KNBS reflected the actual picture on the ground. The government expenditure on construction was mainly taken as the expenditure on housing projects and infrastructure projects.

All the expenditure by the government on other projects not classified as housing or infrastructure projects are assumed to be insignificant.

## **1.9 Definition of Terms**

- i) Time series method. This is a sequence of observations that are made and arranged in accordance to their time of outcome.

- ii) Time series analysis. This accounts for the fact that data points which are taken over time may have an internal structure which should be put into account. This structure may include autocorrelation, trend or difference and seasonal variation.
- iii) Lag. This is a lapse of time for a dependent variable 'Y' to respond to a change in independent variable 'X'. In this case the dependent variable is construction output and independent variables are the five fiscal and monetary factors.
- iv) Stationarity. This is a situation where a time series has a constant mean and a constant variance over time.
- v) Unit root. This is a situation of non-stationarity of the time series data.
- vi) Homoscedasticity. This term means equal variance. It is the antonym of heteroscedasticity which means unequal variance.(Source: Gujarati & Porter, (2009).

### **1.10 Outline of the Thesis**

This thesis is organized in five chapters. The first chapter is an introductory part of the study and looks at the positive and negative effects brought about by monetary and fiscal policies in Kenya's construction industry. The chapter also looks at the importance of the expected results. Chapter 2 looks at the previous work done by various writers and researchers in this field and its relevance to this research. Differences and similarities are pointed out for a good understanding of the problem. From the review of literature, monetary and fiscal policies factors that influence construction output in Kenya will be identified for the research subsequent chapters. Chapter 3 is about the strategy taken in analyzing data for the

purpose of achieving the aim and the objectives of this study as set out in the beginning of the research. The study area and time series variables are considered in this section. Data analysis and interpretation are dealt with in chapter 4. Statistical analysis of the time series data was done in order to find out if there exist influences of monetary and fiscal policies on construction output. Chapter 5 presents study conclusions, recommendations and suggestion on further research areas.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In the previous chapter, this research put down its objectives including its aims which laid the ground for drawing the research hypothesis. In this chapter, previous work which was done by researchers and writers in related area is reviewed and knowledge gap established. The review of literature is done on construction output and the factors that affect it, monetary and fiscal policies of Kenya, construction demand as well as the functions of the Central Bank of Kenya. Finally, conclusions on literature are drawn after establishing the knowledge gap.

#### **2.2 Construction Output**

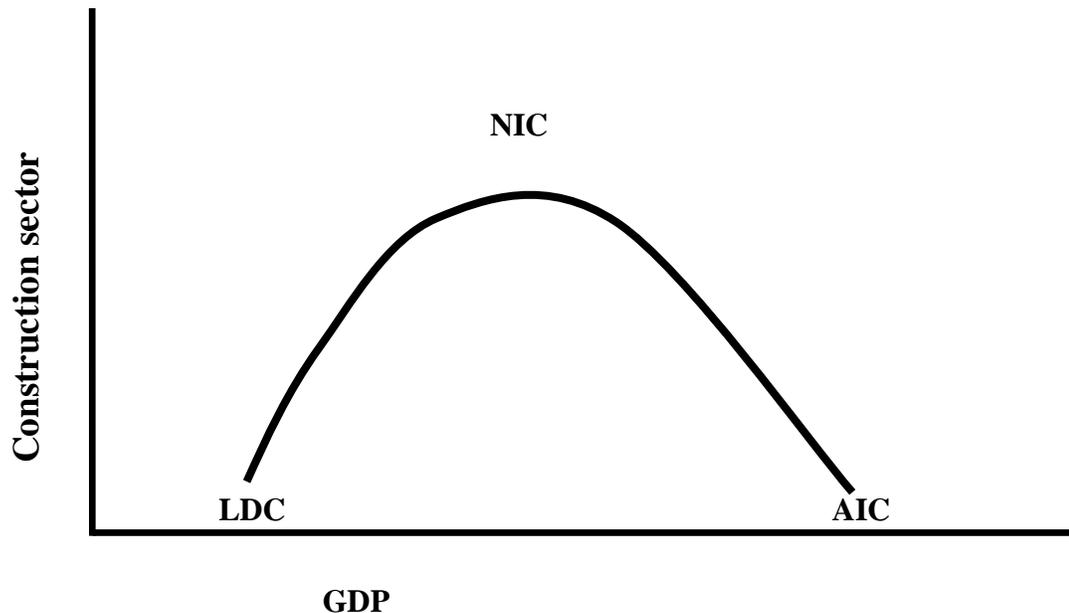
Constructed facilities are referred to as construction output. The method used in practice to quantify constructed facilities is by expressing them in monetary values, as long as the very money values are not the ones which are under investigation as established in Hillebrandt, (2000). In Kenya, this quantification is usually done by Kenya National Bureau of Statistics (KNBS).

The main role of construction industry is provision of physical constructed facilities to give other activities space for taking place. Hillebrandt, (2000) observed that the value in monetary terms of *all the buildings and civil engineering works* in the industry produced within a given duration of time, usually a calendar year, is said to be the construction industry's gross output. According to her, this output is almost 10% on average, on the whole world's Gross National Product (GNP).

In Mawdesley and Qambar, (2000), construction industry is seen as one of those industries which pose many challenges and it is among the leading in the world in

terms of size. However, Mawdesley and Qambar, (2000), felt that construction industry holds the key to the emerging and industrialized countries' prosperity in diverse forms.

Hillebrandt, (2000), pointed out that, the pattern of the relative amount of construction output, as compared to the Gross Domestic Product (GDP), in any nation evolves as the nation develops. This implies that, as the nation is developing from the state of being less developed country (LDC), to the state of being newly industrialized country (NIC), and moving towards being an advanced industrialized country (AIC). She explains that the relative quantity of construction activity in any country displays a bell-shaped outline, whose highest point happens at the centre of the NIC phase. Minimum points occur near the beginning of the LDC phase and at the last stages of the AIC phase. A most important feature which explains this trend is "the dwindling portion of physical assets in investment" that occurs as a country's economy grows. This is a long term change which occurs and takes place alongside the normal happenings of economy's Kuznets and Kondratiev cycles. The period for Kuznets is estimated at 15 – 25 years and that of Kondratiev is 45 – 60 years. The upward trend would be ideal for a developing nation with continuous construction activity growth. See fig. 2.1.



**Figure 2.1:** Bon's curve

(Source: Bon, 1992)

While noting the above relationship which was initially proposed by Bon, (1992) and further saying it is importantly empirical, Girardi and Mura, (2013) say that the literature which has discussed the model is just a mere description. They identified this as a gap and went ahead to provide a stronger substantiation to support Bon's hypothesis using *panel data for world countries for the period 2000 – 2011*. They actually found the relationship to work only when logarithmic transformation of the data is done. This implied that the curve was asymmetric with respect to its maximum. This had a meaning that, a construction activity relative level tended to go up in countries which are developing, peak during industrialization and start reducing at a slow pace in countries which are fully industrialized, approaching stabilization in economies which are mature.

### 2.2.1 Construction Industry

This industry (construction industry) is the sector which is involved in erection,

repair as well as demolition of buildings including civil engineering structures in any one given economy as seen in Hillebrandt, (2000). Though, defining the construction industry in a more conclusive manner is rather not easy; a number of writers have defined the industry somehow in different ways, like for example in Bon, (1992), Harvey, (1996) and Lavender, (1992). To give a definition which is related to national income accounts in use in most advanced and industrialized nations is as stated hereafter: construction industry involves works which are usually carried out on site and are mainly building materials' assembly; the materials including components are made available by various manufacturing industries in the economy's manufacturing sector; site deliveries involves sectors of business and transportation; assembly is done in accordance with procedures which are laid down, including plans of management which are mostly supplied from services sector through commerce service industry; most of the finances required in the industry are availed via the services sector through the industry of financial services; construction sector supplies most of the construction output and then delivers it to real property industry under the sector of services as outlined in Harvey, (1996), Lavender, (1992) and Bon, (1992).

Looking at the definition of construction activity stated above, the industry of construction and that of real property are interlocked; the industry of construction does the *constructed-facility production process* while that of property deals with the *constructed-facility output*. Constructed facilities demand is satisfied either by purchase or lease of a building from a stock which is already existing (e.g. *real property market*) or else by purchasing a new or reformed structures from the industry of construction as found in Akintoye and Skitmore, (1991), Briscoe, (1992), Hillebrandt, (2000), and Raftery, (1992). The role of the industry of construction is nevertheless to provide service to the part of all constructed space demand within an economy which is not satisfied by the stock of constructed space in existence. As a result, sparking a discussion regarding the industry predicament

is liable to spill over to a number of issues which may sternly be associated with property sector as pointed out in Hillebrandt, (2000) and Raftery, (1992).

### **2.2.2 Kenya's Construction Industry**

Kenya is an East African nation. The country has a population of over 46.8 Million people and a population density of 80 people per square kilometer as indicated in Countrymeters, (2015). According to Taborda, (2015) and Countrymeters, (2015), the country has a Gross Domestic Product (GDP - purchasing power parity) of US Dollars 55.24 Billion and a GDP growth rate of 5.3%.

Traditionally, the economy of Kenya was mostly agricultural, with the agriculture itself contributing over 50% to the GDP and employing over 80% of the people who are working as given in Mbaya, (1984). Currently, although agriculture provides employment to 75% of the labor force in the country, its GDP share is 16.3%, and is below the industry's contributions as well as services, which respectively contribute 18.8% and 65% as reported in CIA,(2007). Infrastructure support, in the economy of the country is construction industry's work through buildings construction, provision of housing, spaces for offices, space retailing, construction of factories, roads and railways as well as water supply schemes and irrigation.

The Kenya's construction industry contributes about 40% of the Gross Fixed Capital Formation (GFCF) and 4% in the country's Gross Domestic Product (GDP). About 80,000 people are employed by this industry. However, in the 1980s, its percentage input to the GDP dropped from 6.5% to 4% in the early times of 2000s. This is a clear indication of gross decline in construction activities in the 1990s in the country as explained in Mitullah and Wachira,( 2003).

Construction industry in Kenya mostly maintains an upward trend in growth. Recently; 2013 and 2014, an economic survey report released by Kenya National Bureau of Statistics (KNBS) showed Kenya's building and construction as having contributed 4.8% to the Gross Domestic Product (GDP). The GDP rose from

Kshs.4.73 trillion to Kshs.5.36 trillion in 2014 giving a nominal rise of 13.3% as seen in Macharia, (2015). This gives an indication that the sector is growing, though at a slow pace.

### **2.2.3 Construction Demand**

Absence of construction demand is a sign of retarding construction sector. According to Gruneberg, (1997), interaction of property prices, interest rates and building costs determine the activity in building industry. He asserts that even way back in 1877, this relationship was respected. This is when, according to Gruneberg, (1997), *The Economist's Commercial History and Review* during that year termed as the period of low interest rate as well as soaring property demand, which served as an encouragement to developers who expanded supply which exceeded market sustainability. The reason for developers to build in excess of what could be sold is an inquiry whose response needs a person to know the markets operation which is not within this study's scope. Most important is to note that a number of factors, namely variables, affect the side of demand, while other distinctive and similar set of conditions are the supply side determinants. For purposes of understanding the forces of the market at work, an approach which is systematic is employed, and a single variable can each in turn be examined. In Hillebrandt, (2000) it is also found that the price charged by a developer for a final construction product, either for rent or for sale, a number of factors influence it apart from the construction cost which include land price, taxation system and capital price. In this study, effects of monetary and fiscal policies factors on construction output levels are examined.

### **2.2.4 Construction Effective demand**

Desire to build drives demand for construction. However, Gruneberg, (1997) says that, individual wishes are converted into goods and services a person would wish

to enjoy, by his/her financial capability. Availability of finances makes demand to be effective. This happens when people are willing and able to purchase goods and services at a given time and price. In the construction industry, demand which is effective is based on the number of buildings and construction projects that clients are able and willing to finance. An effective demand is always supported by financial capability to purchase. Therefore, in the absence of financial accessibility in whatever form, no demand can ever be effective according to Gruneberg, (1997). This is even more complicated when one realizes that, the commodities of construction market are not cheap since they involve huge sums of money.

Public and private sectors are mainly the key sources of clients for construction industry. These can further be classified in the following two distinct categories:-

**a) The developer-dealer client**

This client would wish to construct the building and eventually sell it to another person for final use.

**b) Non-dealing developer**

The client in this case commissions the work for his/her personal usage, for example occupation by the owner of the building. Clients of this nature could be a firm in need of a factory, a house for a private family unit or an authority of the public intending to have general public use facility like a hospital or school as explained in Gruneberg, (1997).

It is encouraging to note in Gruneberg, (1997), that benefits emanating from a constructed facility go on for many years while the building took may be a maximum of two years to construct and hence, this leaves building demand as a type of investment. This is also found equally applying to factories in which future production take place. Roads are also included here on which future goods shall be efficiently be transported and lastly, houses from which occupants generate returns

in future years in the form of comfort which can either be greater or lesser.

Gruneberg, (1997), further says the demand for construction is usually a derived one since products of construction are not the final.

### **2.2.5 Factors that Determine Demand for Construction**

The determination of demand for goods and services which are produced by the construction industry is rather a process which is a little bit complicated. This is partly due to a number of factors which include cost, size, longevity and investment nature of the industry and partly due to the broad range of what constitutes construction activity. It is difficult to envisage just one housing market as Myer, (2004) explains.

Factors affecting built facilities construction demand can be categorized as general and local factors. General factors are political, economic, social, and technological, legal/legislative based. Local factors include a combination of building types, procurement types and geographical location which are found in Akintoye and Skitmore, (1994).

As Akintoye and Skitmore, (1994), highlights, the consensus in the construction industry is that the interest rates and general business confidence have the greatest bearing on the private sector workloads. They have however, extended this to the following list of general leading indicators of construction demand which include interest rates, shocks to the economy, demand for goods, surplus manufacturing capacity, ability to remodel, government policy (monetary, fiscal; tax policies), expectation of continued increased demand (for manufacturing goods), expectation of increased profits (On the activities of those that demand construction) and new technology.

The above factors according to Akintoye and Skitmore, (1994) have been investigated as the potential leading indicators of the USA construction demand.

They have also found that for the UK, the general factors affecting construction

demand can be grouped into economic conditions, construction price, real interest rate, unemployment level and Profitability. Almost similar factors have been highlighted in Bickerton and Gruneberg, (2013)

Generally, Hillebrandt, (2000) and Briscoe, (1992) came up with what they called determinants of construction demand. The determinants can be listed as credit availability, condition of the existing stock of built facilities, economic conditions, exchange rates, government action (policy & expenditure), disposable income of households, formation rate of households, rates of interest, inflation rate, supply of money, peoples tastes & preferences for housing, entertainment, planning regulations, political climate (conflict, governance, security etc), population - size, structure and geographical distribution, prices (tender prices, property prices & import prices)

output, taxation, technology, unemployment rate and weather conditions. In Mbiti, (2008), almost similar factors are identified as the specific ones which influence construction sector's activity in Kenya. They include Gross National Product – absolute, growth & per capita, technological developments, social pressures, political instability, interest rates, credit facilities, construction prices, inflation, physical planning, population growth, government – privatization policy and expenditure on buildings & infrastructure, exchange rates and ecology.

Gruneberg, (1997), argues that construction demand is a derived demand. He further went on and described a number of factors that according to him were influential to the construction demand. These factors as highlighted in Gruneberg, (1997) are the price, interest Rates, prices of other products ,income, population size, taste, government policy and expectations.

In Masinde, (2015), while reporting on Monetary Policy Committee decision on base lending rate of CBK, he said that the major concerns of CBK touch on three areas. These three areas are (i) Interest Rate (ii) Inflation and (iii) Exchange Rate. In the US Comptroller's Handbook, (1998), real estate is seen as a cyclical industry which is usually affected by economic conditions both locally and

nationally. The conditions include population growth and rate of employment, expenditure by consumers, rates of interest and inflation.

### **2.3 Monetary Policy**

Monetary policy is a term normally applied in reference to the central banks actions towards achieving macroeconomic policy aims which include stability in the growth of the economy, achievement of stability of prices and to ensure that employment is fully attained (Reserve, 2014).

Njuru, (2012), defines monetary policy as the exercise carried out by central banks to control the quantity of money as well as the interest rates levels for purposes of achieving stability of the economy. According to Investopedia, (2014), monetary policy has been typically used by Central banks to regulate the economy of a country by either ensuring speedy growth or sluggish growth for reasons of avoiding factors like inflation. The economy grows faster than normal if the theory of offering incentives to persons and businesses to have loans and spend through monetary policy which can subject the economy to a faster growth beyond expectations. On the other hand, restriction of spending alongside incentivizing of saving is likely to make the economy grow much slowly. A similar explanation is also found in Mudida, (2009) who defines *monetary policy as one of the public interventionist measures aimed at influencing the level and pattern of economic activity so as to achieve certain desired goals*. He goes on and says this policy covers central bank actions and the government which control the amount, expenditure and accessibility of the economy's money and credit. Particularly, the policy operates on two main variables in the economy. These economic variables according to Mudida, (2009) are interest rates level and the aggregate money supply in circulation.

### **2.3.1 Objectives of Monetary Policy**

The role of a central bank in a country's economy cannot be overemphasized. It is even observed in Nyamongo, Sichei, and Mutai, (2015), that the most important purpose of the Central Bank of this country is as declared on the Central Bank Act (CAP 491) Section 4 which states that the primary objective of the Bank shall be to put together and implement monetary policy towards the achievement and maintenance of the general level of prices stability in the country. The Central Bank shall promote the liquidity, solvency and appropriate performance of an unwavering system which is market-based. In the amendment of 2007, the Act of Parliament as well declares that economic policy of the government shall be supported by the Bank, as well as its employment and growth objectives.

Kenya's monetary policy as Nyamongo, Sichei, and Mutai, (2015) explains, was generally passive and paying attention mainly on the fortification of the country's foreign exchange reserves and sustaining the import substitution policy between the late 1960s to mid 1980s. As from the middle of 1980s to June 2008 according to Nyamongo, Sichei, and Mutai, (2015), Kenya did her monetary policy implementation under the support of IMF programs in the course of using facilities which include SAF – (Structural Adjustment Facility) in 1986, improved SAF - Structural Adjustment Facility and from 1997 to June 2008 used (PRGF) Poverty Reduction and Growth Facility.

IMF's policy formulation apparatus according to Nyamongo, Sichei, and Mutai, (2015) were predominantly the framework of financial programming and are the ones relied upon in all of the programs as the underlying monetary policy management and formulation. The operations of monetary policy inquire about ensuring that monetary growth is in tandem with the inflation intention and sufficient to maintain transactions having economic growth potential.

Kenya's monetary policy is directed towards the achievement of stabilized prices which is the ultimate target. Though, since prices having a lag are the ones affected

by monetary policy, a variable is needed for anchoring policy decisions including economic agents' expectations.

### **2.3.2 Instruments of monetary policy**

As earlier seen, formulation of monetary policy is a major role a central bank and its instruments are very important as seen hereafter. These Central Bank instruments are several and are usually employed on different occasions for monetary control.

Mudida, (2009) explains them as follows:

#### **1) The minimum liquidity assets ratio**

The definition of liquidity assets ratio is actually the share of the total material goods of a bank, which are usually held in cash form and liquid material goods. Banks lending is affected by this instrument and has the benefit that it influences every bank equally and has a prevailing effect in the control of credit creation in view of the fact that it is an undeviating method and its effects are usually felt immediately. Another instrument which is related to this has been the cash ratio through which the central bank may give instructions to commercial banks to maintain a higher or lower percentage of deposits received by them in form of cash. The Central Bank may also call for commercial banks to keep lowest amount of cash balances with it alongside their entire deposit liabilities even though the highest approved balances may not go beyond 20% of the liabilities of total deposit. Reduction of banks free cash base and their capacity to give loans and advances is the main purpose of this instrument.

#### **2) Open market operations**

This has also received increased importance recently as an instrument of monetary policy. It controls the monetary system whereby central banks sells or buys the

marketable securities in the open market. The target of open market operations is the commercial banks cash balances and financial institutions which are not banks. It aims at the institutions' tills and also deals with their accounts held at Central Bank which have reserves in excess. The kind and degree of the operations are highly dependent on the sum of the excessive or insufficiency in the liquidity level in relation to the intention. Excess reserves with commercial banks are mopped up by Central bank through sales of government security holding. Also, additional liquidity is injected through purchase from the existing government securities stock in anticipation of liquidity deficiency.

### **3) Selective credit control**

It is a credit control measure which is qualitative in nature and it is used by central banks to either encourage or discourage some sectors of the economy from being very active. The sectors which are given the highest priority are favored while those which need to be slowed down are discouraged. One way central bank has used this policy is by issuing special directives to commercial banks in respect of investments they make whether in form of loans or advances. Under its statute, the Central Bank can impose limits on any category of loans, advances or the investments the commercial banks make. An example is where the central bank issues an advice to commercial banks and other financial institutions to approve loans for industrial development and lending for speculative purposes to be limited.

### **4) Interest rate policy**

It is an extensively used instrument of monetary policy. For purposes of protecting small borrowers and encouraging investment, the official policy in Kenya has been to follow a low rate of interest policy.

Additionally, development promotion is triggered by stability of interest rates

which has also been emphasized since it is seen as an essential factor. In the year 1991, liberalization of the regime of the rate of interest was done. Determination of levels of appropriate rates of interest by the policy no longer depended on the market forces of supply and demand.

### **5) The exchange rate**

The use of exchange rate as a monetary policy instrument has drawn controversy since Central Bank came into being. It is a currency's worth as compared to another. An argument has been that exchange rate changes of the shilling, which are more often, have an adverse effect on investment due to the linked doubt. In this case, investment in the construction sector is also counted here. The policy of Exchange rate ensures that there is equilibrium between balance of payments and constant differences involving receipts from foreign countries including prolonged payments durations is an indication of external sector development failure to work with domestic policies and exchange rate. Situations such as this require alteration in either the policy types, or both.

### **2.3.3 Monetary Policy Factors that Affect Construction Output**

According to the literature already reviewed, the following factors have been identified as the monetary policy factors that affect/influence construction output.

#### **1) Inflation**

Inflation is defined by Gruneberg, (1997) as the average rate at which prices rise. The inflation rate according to him, is normally issued on yearly basis, but can also be done monthly. This is an economic factor which brings uncertainty to forecast construction budgets and impacts strongly on construction industry. This is due to prices going up unexpectedly and negatively affecting cash flows as Gruneberg,

(1997) explains.

Similar to all products, the cost of replacing construction equipment is usually affected by economic inflation as well as industrial inflation as discussed in Gransberg, Popescu, and Ryan, (2006). The definition of economic inflation is said to be the loss of purchasing power of a nation's currency. Industrial inflation is as well defined as the construction costs change because of long-term as well as short-term commodity pricing fluctuations. A good example is the consumer price index (CPI) which is an extensively reported index of inflation that models the U.S consumer dollar power to purchase. According to Gransberg, Popescu, and Ryan, (2006), inflation index measures the inflation in general across the economy and therefore, it seeks to measure economic inflation. He continues to say that the 2004 to 2005 unprecedented increase in the cost of steel is a good example which is specific to construction industry on the effects of industry inflation. While discussing decision making regarding equipment replacement, Gransberg, Popescu, and Ryan, (2006) says consideration of inflation is very necessary although the equipment manager can ignore its effects if he uses the method of comparative analysis because an assumption can be made that the method equally affects all alternatives available. In Mbiti, (2008), inflation is combined with unemployment and consequently referred to as Misery Index.

The inflation in Kenya hit an all high of 7.08% for the period between September, 2014 and May, 2015. This is according to Kenya National Bureau of Statistics and reported by Wahome, (2015) and Wokabi, (2015) in the Daily Nation.

## **2) Exchange Rate**

This is the cost of a nation's currency when expressed in terms another country's currency. The exchange rate is composed of two main components. These are local currency and foreign currency as seen in Investopedia, (2015). There are two components highlighted in Investopedia, (2015) that can be directly or indirectly

quoted. For the indirect excerpt, the cost of single component of local currency is articulated to conform to the alien currency. Investopedia, (2015), continue to explain that there are those exchange rates which do not have a domestic currency component. They say in that case, the exchange rate can either be referred to as cross rate or cross currency.

Macdonald, (2007) defined nominal exchange rate as foreign exchange unit at a price of home currency. Nominal exchange rate exists in two types. They are namely forward exchange rate and spot exchange rate.

He goes on and explains the spot exchange rate and says it is a bilateral one at which the foreign exchange are delivered immediately after being bought or sold where it takes not more than two days. He also defines bilateral forward rate, as the rate which is negotiated in like say today at a particular time (t) for future delivery of the foreign exchange after it has been bought and sold.

Exchange rate effects can be felt when a construction projects' materials or components of a building are being imported in greater proportions as indicated in Gruneberg, (1997). It is also explained by Gruneberg, (1997) that, if the sector of construction operates at or near maximum capacity, contractors will be unable to meet their demand for construction and this will raise prices for tenders which in turn brings about inflationary pressures.

### **3) Interest Rate**

This is the annualized cost of credit or debt-capital computed as the percentage ratio of interest to the principal amount as found in Business Dictionary.com, (2014). According to this Business Dictionary.com (2014), a bank can choose to determine its own interest rate on loans but, practically, local rates are almost the same from one bank to the other. Generally, interest rates tend to rise in times of inflation, high demand for credit, tight money supply, or even due to greater reserve requirements for banks. An upward trend in interest rates for any reason tends to dampen activities of businesses and this can as well be experienced in construction

business.

The US Comptroller's Handbook, (1998), says that investments into the real estate are very sensitive to interest rates and therefore, this should form a careful consideration in the real estate industry lending. When sourcing for funds for real estate project, the availability and cost of financing is usually affected by interest rates. Also affected by this interest rate are the real estate financial viability and construction costs. Looking at the rate of floating for a number of money owing and many leases which are on fixed rate, escalating rates of interest are injurious to projects of real estate capacity of repayment in the future. Real estate market liquidity is usually reduced by increased interest rates especially when investors are attracted by alternative investments as observed in the US comptroller's Handbook, (1998).

#### **2.3.4 Interest Rate Risk**

It is noted in the US Comptroller's Handbook, (1998) that this is a risk that results from rate of interest movement against capital or earnings. The viewpoint of the economy is more focused on the bank value in the current rate of interest situation and that value sensitivity to rate of interest changes. The risk of rates of interest comes from variations between cash flow timing and the rate changes timing.

#### **2.3.5 Effects of interest Rates on construction Output**

At times of economic recession, there is usually down scaling, delaying or even complete indefinite postponement of construction projects. A number of reasons determine these decisions but interest rates cannot be overemphasized. A good example is when developers in the process of decision making use discounted rates to determine a construction project's viability as an investment. Before adoption of the development idea, it has to be confirmed that *internal rate of return (IRR)* is above the chargeable rate of interest to cover the risk. If it can be said that a

decision to build is determined by rates of interest, then the link between the rates of interest and the output of construction industry should be keenly established and eventually defined as fresh construction and works of maintenance as is done on site by contractors. This is explained in Bickerton and Gruneberg, (2013).

They further say, there is a relationship between levels of income and rates of interest. According to Bickerton and Gruneberg, (2013), this is due to real interest rate effect on goods' real cost and especially those bought on credit. All property types as well as construction projects are affected.

The effects of Interest rates as per the US Comptroller's HandBook, (1998) and Bickerton and Gruneberg, (2013) in a nutshell include:-

1. Reduction in real estate market liquidity.
2. Low construction business activity.
3. Affects availability and cost of financing.
4. Real estate financial viability and cost of construction.
5. For leases and loans, escalating rates of interest are injurious to projects of real estate capacity of repayment in the future.

There are quite a number of writers who have done a lot of work concerning construction output and rate of interest. These writers include Akintoye and Skitmore, (1994).

In Kenya today, there are quite a number of interest rate types as indicated in Kenya National Bureau of Statistics, (2014). They are divided into two categories which include those operating or charged by CBK and those charged by commercial banks in Kenya. The ones charged by CBK are the 91 days Treasury Bills Rate, Central Bank Rate (CBR), Repo rate and Inter-bank rate. The repo rates can either be repos or reverse repos. They are usually agreements done by CBK and commercial banks

to buy/sell securities of the government to/from commercial banks at an arranged rate of interest referred to as the REPO rate for a given duration with an understanding that the security will be repurchased or sold by the commercial banks to CBK once the duration comes to an end. The duration is mostly decided by the CBK (Monetary Policy Committee, 2015).

Those interest rates applied by commercial banks in Kenya include, average deposits interest rate, savings deposit interest rate, loan and advances interest rate and overdraft interest rate.

## **2.4 Fiscal Policy**

Fiscal policy according to Njuru, (2012) is the social and economic development stimulation by central government in the course of pursuing a policy standpoint that ensures a sense of steadiness among taxation, expenditure as well as borrowing consistent with growth sustainability.

According to Investopedia, (2015) and Reserve, (2014), Fiscal Policy is the spending policies of a government that manipulates the conditions of the macro economy. They go ahead and say that it is through this fiscal policy that regulators attempt to improve rates of unemployment, control of inflation, stabilization of business cycles as well as influencing rates of interest in an attempt to achieve an economic control. Largely, the fiscal policy is usually on the base of ideas developed by an economist from Britain known as John Maynard Keynes who lived between 1883 and 1946. This economist believed that adjustment of tax rates and governments spending could influence economic performance. Therefore government spending and taxation are guided by fiscal policy as Amadeo, (2015) explains.

### **2.4.1 The fiscal policy objectives**

Fiscal policy is government's discretionary measures which are taken to influence

the bearing of an economy by way of changing the intensity and structure of public funding and expenditure. Its contribution to the economy is by delivery on at least the three most important government functions which include, efficient resources allocation, distributing incomes in a fair manner and economic activity stabilization. The named functions are achievable through the influence of fiscal stabilizers and discretionary fiscal adjustments, or by a combination of all of them. Kenya's fiscal policy has been entrenched in two long-term policies and a number of 5-year plans of National Development that guide investment and planning. These include the 1965 Sessional paper No.10 which elaborates Socialism in Africa and how it's applied in Kenya and the 1986 Sessional Paper No.1 which talks about Management of an Economy for Renewal of Growth. Since 2003, the government chose to adopt the *Economic Recovery Strategy (ERS)* and the current Vision 2030. A number of initiatives which have had an express bearing on fiscal policy in Kenya have been implemented. They include, *the introduction of the Medium Term Expenditure Framework (MTEF) in 2000/2001, the Poverty Reduction Strategy Paper (PRSP) and the Poverty Reduction Growth Facility (PRGF)*, among others which are found in Nyamongo, Sichei, and Mutai (2015).

#### **2.4.2 Types of Fiscal Policy**

Basically according to Amadeo, (2015), two types of fiscal policy exist.

##### **a) Expansionary Fiscal Policy**

Expansionary fiscal policy is one of the most widely used. Its purpose is to arouse the financial system and generate more growth of the economy although according to (Morrissey), it appears to be an empirical question as to whether a fiscal policy of a government arouses or stifles growth. It is the most significant during the contractionary period of the business cycle, when people clamor for reprieve from an economic recession as is discussed in Amadeo (2015).

Expansionary fiscal policy works by either the government spending more or by cutting/reducing taxes or even by both methods if possible. The main idea according to Amadeo, (2015) is to ensure more money is in the hands of consumers to ensure that they also spend more. In this way, demand is jumpstarted to ensure businesses are kept running, and moreover, job creation. A debate has ensued, states Amadeo (2015) to compare the two methods; government spending and tax cuts to find out which of the two works better than the other. Tax cuts are advocated by supply-side economics. They say it makes businesses free to employ more workers to trail ventures in business.

#### **b) Contractionary Fiscal Policy**

This is also found in Amadeo (2015), where it is said that the other type of fiscal policy is the contractionary fiscal policy. This is the second type of fiscal policy and it is rarely used. There is only one single reason why one would want to do this. This is because of its application in slowing down growth of the economy. This is done to eradicate inflation due to its long-term damaging effect on the standard of living.

Contractionary fiscal policy tools are applied in reverse such that there are increased taxes and a reduction in government spending. This policy is wildly unpopular among citizens and therefore not commonly used. Where this policy is required to prevent inflation, monetary policy is used instead as it is found in Amadeo (2015).

#### **2.4.3 Tools of Fiscal Policy**

Fiscal policy tools are only two: Taxation and expenditure. They are discussed below.

##### **1) Taxation**

This is the first tool, which involves taxation of income, Property sales, capital gains from investments, or any other income. The major source of revenue to fund government is provided by taxes. The negative aspect of taxes is that it reduces income to the earners so that they have less to spend and therefore this makes taxes quite unpleasant to the income earners as Amadeo, (2015) explains.

## **2) Spending**

This is the second tool of fiscal policy. Provision of subsidies from the government, payments transfer and welfare programs, contracts of all types of public works performance, and definitely payment of salaries to all government employees -- to name but just a few of these. The main reason why spending by the government is a tool, is because those receiving the funds have more to spend and hence drive the demand and growth of the economy. This tool is discussed in Amadeo, (2015).

Over the last two years, Macharia, (2015) says construction has been the best performing sector due to increased government spending in a number of construction projects. The sector witnessed a growth of 13.1% and 5.8% in 2014 and 2013 respectively.

He attributes this growth to property development growth, a real estate sector which is vibrant and the mega projects in infrastructure which are currently ongoing. The economic survey report by KNBS listed a few government projects as the main contributors to the growth. They include the following according to Macharia, (2015): i) Roads construction ii) Expansion of airports and iii) Standard Gauge Railway construction from Mombasa to Nairobi

In Macharia, (2015),the following government projects are given as the major ones which propelled the construction sector to the current level of growth. The projects are listed alphabetically as:

- 1) Construction of geothermal and wind power generation plants.
- 2) Construction of the rail link to South Sudan.

- 3) Development of Lamu port and associated infrastructure.
- 4) Rehabilitation of major airports.
- 5) Road construction and rehabilitation
- 6) Urban housing development to meet the rising housing demand

#### **2.4.4 Fiscal policy Factors that Affect Construction Output**

##### **i) Taxation**

An economic growth can be fuelled through tax rate reduction by the government. Lower taxes paid by people means that they have more money which they can spend or put in an investment like a building which is a construction output. Improved economic growth is brought about by increased consumer spending or investment. Economic regulators would somehow wish not see too much of this spending increase since it triggers increased inflation. Investopedia, (2014) explains this economic scenario.

Kenyan tax payers are regarded as heavily taxed. This is due to number of taxes and levies that they have to comply with. The taxes range from income tax, value added tax, customs duty, exercise duty, dumping duty, Kenya Bureau of Standards Levy, industrial Training Levy, insurance levy, business permit fees (payable by Nairobi residents to the city County), Transport Licensing fees and various other (payable to the City County). Others are catering levy, the national hospital insurance fund, the fuel levy, the motor vehicle road license fees, the import declaration form fees, television and radio license, driving license fees, the rural electrification levy, the electricity regulatory board levy, the exchange rate surcharge (levied by Kenya Power and Lighting), the stamp duty, the dairy board levy and finally the Sugar Authority levies highlighted in Kalinga et al, (2003).

##### **ii) Government Spending**

The other possibility as explained by Investopedia, (2014) is by the government where it decides to amplify its own spending. A good example is initiating construction projects like by constructing additional highways or building structures.

This scenario was seen recently in this country when the government initiated Economic Stimulus Projects (ESP). The thought is that the extra spending of government comes with job creations and unemployment rate is usually lowered. A number of economists, though, dispute the concept that this can be created by the government, this is due to the fact that taxation is the main source of government's money – this is to say, from the private sector's productive activities.

#### **2.4.5 Effects of Fiscal Policy**

According to Investopedia, (2014) fiscal policy has its own challenges in that particular groups are affected disproportionately. A decrease in tax applied, may affect differently the income levels of taxpayers, or different groups may experience higher decreases while others experience lower decreases. As well, government spending increase has the biggest impact on the receiving group of the government spending, which is the construction worker in the case of highway construction project.

A country's economic performance is usually driven by policies; fiscal policy and monetary policy. Supply of money of a country is influenced by the country's central bank through monetary policy. Flagging economy is boosted by regulators using both policies to quench an overheated economy or keep a strong economy (Investopedia, 2014).

According to Wahome, (2015) building and construction boosted the Kenya's economic growth in 2014/2015 financial year due to increased government spending in principal infrastructure projects such as *standard gauge railway, roads and private sector investment in real estate development*. The sector also saw an increased job creation in the country.

## **2.5 Summary and Conclusions**

From the literature reviewed, it has been seen that numerous factors influence construction output. This is evident in Gruneberg, (1997), Briscoe, (1992) and Hillebrandt, (2000), where these factors have been listed and explained. But what can be found from the literature is that, the factors are discussed and stated generally. Nowhere in the literature are the factors categorized as fiscal or monetary. Therefore, what can be deduced from the studies done so far is that factors that fall within the scope of this study and fall within the two categories are as shown overleaf:-

### **1) Monetary Policy factors**

These include Exchange rate, Inflation and Interest rate.

### **2) Fiscal Policy factors**

They are Government Spending, Tax rate and Tax on goods.

Influences of the above listed monetary and fiscal factors are based on basic economic theory. Accordingly, the factors tend to negatively affect construction output through increased costs of construction finances and construction materials. It is only one fiscal factor that is thought to contribute positively on construction output in Kenya, the government expenditure on construction. The rest of the factors have negative effects on construction output. These factors are commercial banks weighted interest rate, inflation rate, dollar/shilling exchange rate and total tax on products as amplified in Gujarati & Porter(2009), Judge *et al*, (1988) and Pokorny, (1987). The next Chapter lays down the methodology for establishing these effects.

### **2.5.1 Theoretical Framework**

The law of demand states that, if all other things are held at equilibrium, or in other

words, *ceteris paribus*, the lower the cost of a good, the higher the number of the goods is demanded, as seen in Mithani and Murthy, (1998) and Mudida, (2009). Therefore, as Gruneberg, (1997) explains, building prices is perhaps a single factor that influence property demand. He adds that if other things remain the same, the more the cost, the lesser the construction demand; the lesser the cost the higher the construction demand. This is according to Gruneberg, (1997), the first law of supply and demand.

It has been seen that, there are numerous factors that influence demand for construction output levels. This study takes a keen look at the link between fiscal and monetary policy factors and construction industry output levels in Kenya just as Bickerton and Gruneberg, (2013) did for UK's construction industry output and London Interbank Offered Rate.

### **2.5.2 Knowledge Gap**

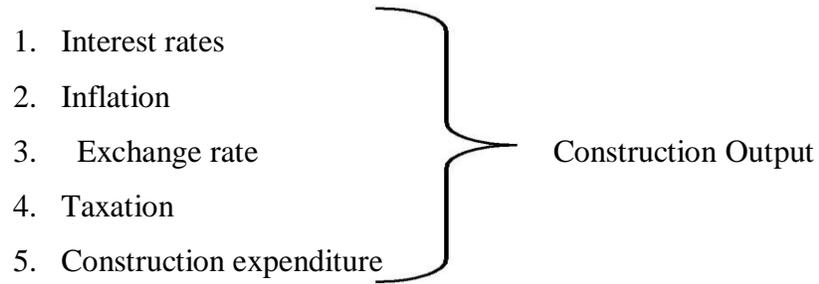
The knowledge gap is that *there is no tool or tools already developed in Kenya to control and manage construction industry for increased output levels*. This study therefore endeavors to come up with a multiple linear regression model which shall serve as a tool to control and manage construction sector in the country and fill this gap in our knowledge.

### 2.5.3 Conceptual Framework

The conceptual framework for this study was set up as seen hereunder.

#### Independent variables

#### Dependent Variable



The five explanatory variables are expected to have a significant influence on construction output in Kenya.

## **CHAPTER THREE**

### **RESEARCH DESIGN AND METHODS**

#### **3.1 Introduction**

In this chapter, all the steps are described in the order that was followed in doing the study. These steps describe the study design and strategy, research instrument which was used to collect data, method of analyzing data, the description of the study area and variables in the study.

#### **3.2 Research Design**

The aim of this research was to answer whether or not, monetary factors, and fiscal factors are effective policy instruments to influence construction output in Kenya. Therefore the study was designed to gather statistical data from CBK and KNBS. The data collected in its raw form included time series data for construction output, total tax on products, government expenditure on construction, commercial banks' weighted interest rate, inflation rate and Kenya shilling per US dollar.

There are about five research designs which a researcher can use depending on the nature of the research. According to Mugenda, (2003), Bryman, (2012) and Mwituria, (2012) the research designs are: (i) Experimental Design - which is a blueprint of the procedure that enables the researcher to test his hypothesis by reaching valid conclusions about relationships between independent and dependent variables. It refers to the conceptual framework within which the experiment is conducted. (ii) Cross-sectional research Design - this is observational in that researchers just record information about their research subjects without manipulating the study environment. The most important feature of this design is that it can compare at a single point in time different population groups. (iii) Case study - this is a study design where an investigation strategy involves extensive exploration of a single unit of study, which

h may be a person, family, group, community or institution, or a very small number of subjects whose examination is intensive. The variables number is usually very large in this research design. (iv) The comparative method is mostly used in the initial stages of the development of a branch of science. This helps the researcher to ascend from the early level of exploratory case study to a more advanced level of general theoretical models, invariance, such as causality or evolution. The comparative research design is not complicated. The objects are specimens or cases which are similar in some respects (otherwise, it would not be meaningful to compare them) but they should have differences in some respects. These differences become the focal point of examination. The purpose is to find out why the cases are different: to expose the general underlying structure which generates or permits such a variation. (v) Longitudinal Design - similar to cross-sectional design, this is also observational since the subjects are not interfered with by the researcher. However, in a longitudinal study, a researcher may conduct several observations of the same subjects over a very long period of time, sometimes lasting several years.

The benefit of this study design is that a researcher is able to detect developments or changes in the characteristics of the targeted population at both the group and the individual stage. The key point here is that longitudinal study extends beyond a single moment in time. As a result, a longitudinal study is able to establish a sequence of events.

The researcher therefore adopts this study design. This design Bryman, (2012) looks at it as representing unique kind of research design. He explains this further by saying it is a rarely used design due to time and financial implication. Longitudinal research design according to Bryman, (2012) allows for good deal of insight regarding variables which are time ordered and hence there being a possibility of an allowance to make a *causal inference*. Bryman, (2012), points out that this design can only be applied in a quantitative research and therefore, this research took into account only quantitative data, which was collected from the two

institutions of the government of Kenya. The institutions are mandated by law of the land to compute and compile the statistical data which was required by this study regarding six variables. Quarterly data on the variables was collected and analyzed.

### **3.3 Research Strategy**

There are only two research strategies, namely qualitative and quantitative research strategy. Qualitative Research according to Bryman, (2012) is mainly exploratory research. It is used to achieve an understanding of underlying reasons, opinions, and motivations. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research.

To arrive at the objectives of this study, quantitative data were collected. As explained in Maina, (2012), quantitative study measures what it assumes to be statistically a reality in anticipation of coming up with universal laws. Maina, (2012) defines quantitative research as an inquiry into an identified problem, based on testing a theory, measured with numbers and analyzed using statistical techniques. To establish the fiscal and monetary factors that influence construction output of Kenya, quantitative research strategy was adopted.

Quantitative research has also been explained in Bryman, (2012) as a research approach in which quantification is emphasized in the way data collection and analysis is done. In this research strategy according to Bryman, (2012) is found to involve:

- o Deductive paradigm to the connection of a study and theory where the intonation is put on examining theories.
- o Practices' incorporation and conditions of natural study pattern and specifically of positivism as well as

- o Exemplifying a notion of common certainty as a peripheral, objective truth.

### **3.4 Target Area**

Kenya was the research area for this study. This research thesis touches on the country's economy on how to improve it through one of the major sectors.

There are quite number of reasons why the researcher chose this area for this particular study. To mention but just a few of these reasons include:

- i) The researcher is Kenyan and a resident in the country.
- ii) The data which was needed by the researcher was available to larger extend.
- iii) Most of the data was in the public domain, hence easy to obtain/collect
- iv) The cost of the data collection process was reduced
- v) The researcher was conversant with the offices holding the data and hence time was saved in the whole process of data collection.

From the foregoing, the researcher ended up in saving both the costs and time which was very crucial in the process of doing the study.

### **3.5 Data Collection**

This study adopted purely a quantitative strategy and for this reason, quantitative data were obtained from the Central Bank of Kenya (CBK) and Kenya National Bureau of Statistics (KNBS). This was time series data which included data for monetary policy factors, fiscal policy factors and construction output from 2000 to 2013. Time series method which is also called a random process in discrete time was used to analyze the data. This method as explained in Lapinskas, (2013) involves a sequence of observations that are made and ordered according to their

time of outcome.

The KNBS and CBK provided all the data which was required for analysis in this study. The two institutions are the only ones which compute the time series data required for analysis in this study.

The data which were collected using a data abstraction sheet or simply data sheet, from the two institutions in its raw form was not consistent with the objectives of this study. The researcher put it in a format which enabled analysis with respect of the objectives of this research. The raw data is found in appendix A.

There were quite a number of frequencies at which the time series data could be observed. The commonly used frequencies according to Lapinkas, (2013) include daily, weekly, monthly, quarter yearly, half yearly and yearly. For purposes of this study, the data was ordered quarterly.

The researcher adopted a data abstraction sheet or just simply a data sheet as a research instrument for the study. Data sheet, like the one appearing in Zaza, *et al.*, (2000) was designed as a standard sheet for statistical data abstraction for any quantitative research. The so called abstraction form is in form of a booklet containing twenty-six pages which according to Zaza, *et al.*, (2000) is a useful evaluation tool for papers to be published. Data sheet was also used in Mbiti, (2008).

The data sheet had eight columns and each column headed by the name of a variable being investigated. The time series data collected in this research were mainly rates which made 50% of the data and total tax on products, government expenditure on construction and quarterly construction output which were normally presented as Kenya Shillings. Therefore, the data sheet was simple to construct. The data sheet is annexed in appendix B.

### **3.6 Variables in the Study**

This study investigated the monetary and fiscal policy factors that influence construction output in the country. These factors which were under investigation were classified as monetary or fiscal policy factors and were the main variables in this study.

#### **3.6.1 Dependent Variable**

The dependent variable in this study was the construction output. This was the formal construction output as compiled by the Kenya National Bureau of Statistics (KNBS). The data for this variable was obtained for the period between 2000 and 2013.

#### **Construction Output Levels ( $CO_t$ )**

This is the total constructed facilities as delivered by the construction sector of any given economy in a given period of time ( $t$ ), usually a year. This is normally expressed in monetary terms and given as construction GDP in the national accounting system. Its growth can be said to be the quantitative change in construction market value of the constructed facilities produced in a given country per year. Therefore, Gross Domestic Product of construction sector in a country is derived as the net value of all construction or constructed facilities produced in an economy in a particular period of time. In the case of Kenya, this can either be quarterly or annually.

Like all other constituents of a country's GDP, construction output was based on the 2001 constant prices which was the base year before rebasing was done.

#### **3.6.2 Independent Variables**

These were the explanatory variables which included the monetary and fiscal policies factors. The factors were:

- i) Commercial banks weighted interest rates ( $CBWR_t$ )
- ii) Exchange rates ( $ER_t$ )
- iii) Inflation rate ( $IR_t$ )

- iv) Construction expenditure ( $GEC_t$ )
- v) Taxation ( $TTP_t$ )

The explanatory variables are further explained as follows:

**(i) Interest rate ( $CBWR_t$ )**

This is the cost of borrowed finances to the borrower. This study dwelt much on commercial banks' weighted interest rate which is the rate used by commercial banks to lend to their clients. Interest rates play a major role in construction and property markets due to their dependency on borrowed finances. The rate of interest that is used by banks to lend to their borrower is the nominal interest rate. To arrive at this nominal rate, inflation rate is added to real rates of interest. Therefore, if inflation rate is subtracted from the nominal interest rate, we get the real rate of interest. It is therefore the nominal rate of interest which the commercial banks adjust to include their profits in order to apply it in their money lending business.

Statistics from CBK show that up to June, 2015, construction sector had borrowed up to 58% of all the funds spend in the sector.

**(ii) Exchange rate ( $ER_t$ )**

This is a currency's worth as compared to another. Exchange rate movements, of the Kenya Shilling to the U.S Dollar, are expected to reflect on the financing of construction projects from outside the country. The researcher also expects this phenomenon to play out in projects which depend mostly on imported materials. Therefore, the researcher collected data for analysis to find out how it affects the output of construction in Kenya.

**(iii) Inflation rate ( $IR_t$ )**

Inflation rate is the rate at which general prices of commodities rise in an economy

as indicated in the Consumer Price Index (CPI). Inflation is actually the percentage change of the CPI over a one-year period. It has an impact on construction output in that, when prices of commodities go up, like for example cement prices, the construction sector delivery may be lowered due to cost factor. Also, when basic commodities prices rise, people tend to concentrate on meeting basic needs and stop thinking about investment in industries like construction due to huge investment sums involved due to maybe high inflation rate.

This is one of the major reasons why inflation rate is a key monetary policy objective of the Monetary Policy Committee (MPC) of the central bank to keep it as low as possible and maintain stable prices within the country.

The Government through the CBK set the medium-term overall inflation target as 5 percent for the Fiscal Year 2015/16 allowing a margin of 2.5 percent on both sides. This appears achievable since the rate has been operating around 7% lately.

#### **(iv) Construction expenditure ( $GEC_t$ )**

The government of Kenya spends huge sums of money in construction every fiscal year. This plays a big role in meeting the needs of Kenyans in general by providing shelter and infrastructure services. The researcher was interested in finding out whether this expenditure by the government in construction sector has any influence on the output of the sector in the country. The researcher obtained data on the expenditure on housing and road construction for period of fourteen (14) years. To make it conform to the analysis procedure, the data was organized into quarters to match the data organization of the other variables in the study.

#### **(v) Taxation ( $TTP_t$ )**

Taxation in Kenya, being the major revenue collection method for the government, impacts very strongly on the disposable income of a person. This is quite so when one also realizes that a Kenyan pays numerous types taxes. As observed in Kalinga

*et al*, 2003), Kenyan tax payers are regarded as heavily taxed. This is due to number of taxes and levies that they have to comply with. The taxes range from income tax, value added tax, customs duty, exercise duty, dumping duty, Kenya Bureau of Standards Levy, industrial Training Levy, insurance levy, business permit fees (payable by Nairobi residents to the city County), Transport Licensing fees and various other ( payable to the City County). Others are catering levy, the national hospital insurance fund, the fuel levy, the motor vehicle road license fees, the import declaration form fees, television and radio license, driving license fees, the rural electrification levy, the electricity regulatory board levy, the exchange rate surcharge (levied by Kenya Power and Lighting), the stamp duty, the dairy board levy and finally the Sugar Authority levy.

All the above taxes reduce one's financial capability to invest in a sector like the construction sector which requires huge amounts of capital. In addition, VAT has a direct impact on the industry especially when buying materials for construction.

For this reason, the researcher collected data from KNBS on total taxes levied on products to establish whether this impact can be proven statistically.

Data for time series of variables should be collected for the longest time possible. In this case, data for all the six variables were collected from the year 2000 to the end of year 2013. This is not a very short duration, but is usually better if the time series is very long. The limitation was attributed to change of system of national accounting (SNA) which mostly affected construction output which is the dependent variable. The data for this variable was not consistently available for the period before the year 2000 although what was collected for the same variable was still sufficient for analysis.

The conceptual and operational definitions of the variables are given in table 3.1 overleaf.

**Table 3.1: Conceptual Definition and Measure of Variables**

<b>Variable</b>	<b>Variable</b>	<b>Definition</b>	<b>Definition</b>
<b>Commercial Banks Weighted Interest Rate</b>	CBWR	The rate used by Commercial banks to lend money to their Customers	Percentage (%)
<b>Exchange Rate</b>	ER	The amount at which the shilling exchanges to the dollar	Kenya shilling (Kshs.) per US. Dollar
<b>Inflation Rate</b>	I R	The average rate at which prices rise	Percentage (%)
<b>Government Expenditure on Construction</b>	GEC	The amount the GoK Spends in each fiscal year in construction	Kenya shillings in Millions
<b>Total Taxes on Products</b>	TTP	Value added tax (VAT) Total Collection in Kenya	Kenya shillings in millions
<b>Construction Output</b>	CO	Constructed facilities	Kenya shillings in Millions

**Source:** Author, (2016)

### **3.7 Data Analysis**

In this research, there was only one type of data collected. This was quantitative data from Kenya National Bureau of Statistics (KNBS) and Central Bank of Kenya (CBK). The quantitative data was collected using data sheets.

The data was analyzed using time series analysis method. The method is the only one which can be used for time series data such as the ones in this study. The procedure which was followed involved entering the data into a computer using Microsoft office Excel software and then was opened from Economic Views (Eviews) software as foreign data which was eventually turned into an Eviews work file. The time series data were first checked for stationarity and since they were found to be nonstationary, they were consequently transformed to avoid spurious or nonsensical regression. It is generally assumed that all time series data used for empirical work is stationary as is found in Gujarati and Porter, (2009). It was therefore quite essential according to Gujarati and Porter, (2009) to establish whether the relationship among economic variables is nonsensical or spurious.

A logarithm plot of all fiscal policy time series factors and construction output was done. Logarithmic transformation of these three variables was necessary to reduce the problem of heteroscedasticity. The remaining three monetary policy factors were almost homoscedastic and hence were plotted without logarithmic transformation. The plots were done to observe the trend of all the series which implied nonstationarity of the time series data. After observing the plot behaviors, the researcher made a decision to apply the first differences to make the data stationary. This was exhibited by a graph which had no trend.

Autocorrelation functions (ACF) and Correlogram test were also carried out for purposes of comparison with the graphical analysis.

Unit root stationarity test which is the most authoritative test was also conducted. This test method is also called the Augmented Dickey-Fuller (ADF) unit root test in honour of Dickey and Fuller who developed it. It is among the best tests since it augments two methods which were initially developed by the duo. The method was used to test the

data before and after differencing to ensure complete stationarity. The method tested the hypothesis that “the variable has a unit root.” The presence of a unit root meant the data of a particular variable were nonstationary. The test was carried out at  $\alpha = 0.05$

confidence level.

After ensuring that all the time series data were stationary, multiple regression was carried out where construction output was regressed on all the explanatory variables.

The regression model which was used in this analysis was:-

$$CO_t = \alpha + \beta_1 CBWR_t + \beta_2 IR_t + \beta_3 ER_t + \beta_4 TTP_t + \beta_5 GEC_t + \varepsilon_t$$

Where: CO = Construction Output

CBWR = Commercial Bank' Weighted Interest Rates

IR = Inflation Rates

ER = Kenya shilling per US dollar Exchange Rate

GEC = Government Expenditure on Construction

TTP = Total Tax on Construction

$\beta$  = Regression Coefficient

$\alpha$  = Intercept (the value of  $CO_t$ , when values of all the explanatory

variables are set at (0) zero.)

$\varepsilon$  = Error Term or Residual

t = Specific Quarter year

The null hypothesis was  $H_0: \beta_i = 0$

The research hypothesis  $H_1: \beta_i \neq 0$  for at least one coefficient  $\beta$

Construction output (CO) was regressed on the explanatory variables, applying the first

difference of monetary policy factors and natural logarithms of the first differences of fiscal policy factors. The ordinary least squares method was used in the time series regression analysis.

## **CHAPTER FOUR**

### **DATA ANALYSIS AND RESULTS**

#### **4.1 Introduction**

In chapter three, the methodology followed in this study has been laid down. This chapter shows how the methods were applied and eventually how results were obtained. This chapter is organized in the following main parts which include graphical analysis of the variables, data tests and stationarity transformation, correlation and regression analysis. And finally, a model is developed which describe construction industry of Kenya in relation to fiscal and monetary policies.

This research had a target of obtaining data from Kenya National Bureau of Statistics (KNBS) and Central Bank of Kenya (CBK). The data were collected for six variables namely; construction output (CO), commercial banks weighted interest rate (CBWR), inflation rate (IR), dollar/shilling exchange rate (ER), total tax on goods (TTP) and government expenditure on construction (GEC). The time series data were obtained for the quarterly period between the year 2000 and 2013. This period translated into fifty-six observations which were more than what Bickerton and Gruneberg, (2013) and Mbiti, (2008) used in their analysis.

The data could not be obtained for year 2014 due to ongoing process of rebasing. The government is improving its system of national accounts (SNA) by changing the base year from 2001 to 2009. For this reason, data for 2014 and part of 2015 were left out. The checklist was sufficient enough to extract the data which was relevant to this study. The data abstraction sheet or the checklist was as shown in appendix B.

#### **4.2 Graphical Analysis**

This analysis was carried out on the variables to catch a glimpse of the growth of each. This is a common practice which involves plotting a logarithm of a time series. All the time series in this study were plotted and specific observations for each variable

recorded for stationarity considerations. Construction output and fiscal policy factors data were transformed into their logarithms to reduce heteroscedasticity problem at each sample point as can be seen in Gujarati and Porter, (2009), Pokorny, (1987) and Judge, *et al.*,(1988).The variables which presented this problem were:

- 1) Construction output
- 2) Government expenditure on construction and
- 3) Total tax on products

The rest were almost homoscedastic and hence were not transformed to natural logarithms. These variables included:

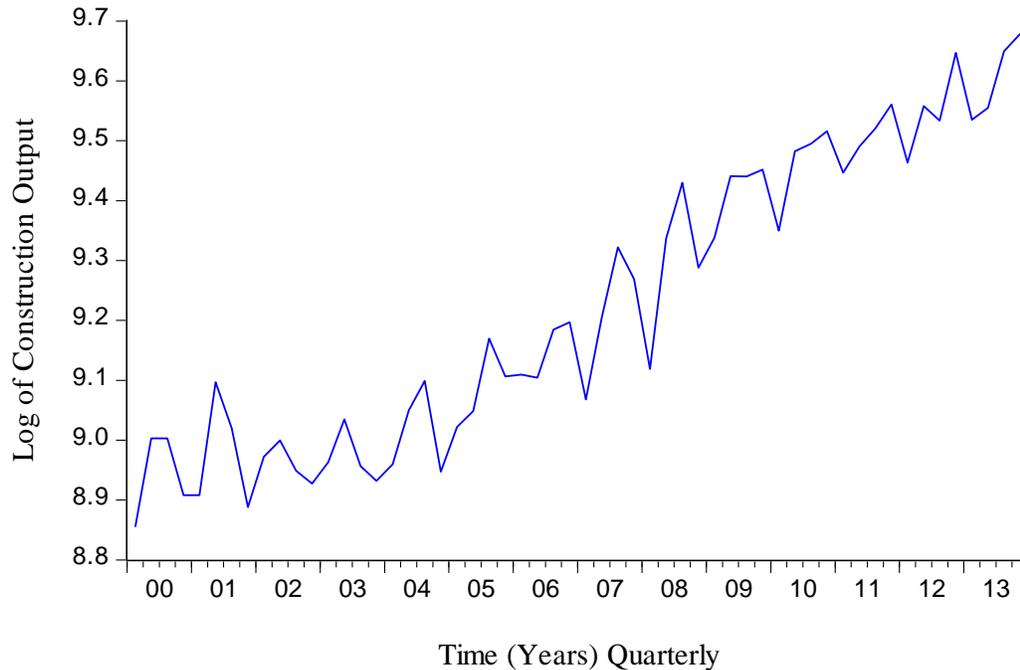
- 1) Commercial banks' weighted interest rates
- 2) Inflation rates and
- 3) Kenya shilling to US dollar exchange rate

The natural logarithm ( $e^x$ ) plots for the three variables and the ordinary plots for the remaining three variables are amplified below using figures 4.1 to 4.6.

#### **4.1 Construction Output**

Construction output in Kenya maintained an upward trend from the year 2000 to 2013, though with fluctuations. It grew from Kshs. 7.009 billion in the year 2000 to Kshs. 15.968 billion in 2013. This is an indication that the sector in Kenya is growing, though at a slow pace. Figure 4.1 gives a clear picture of this construction sector behavior over the period in question.

For the raw data of this variable, see appendix A.



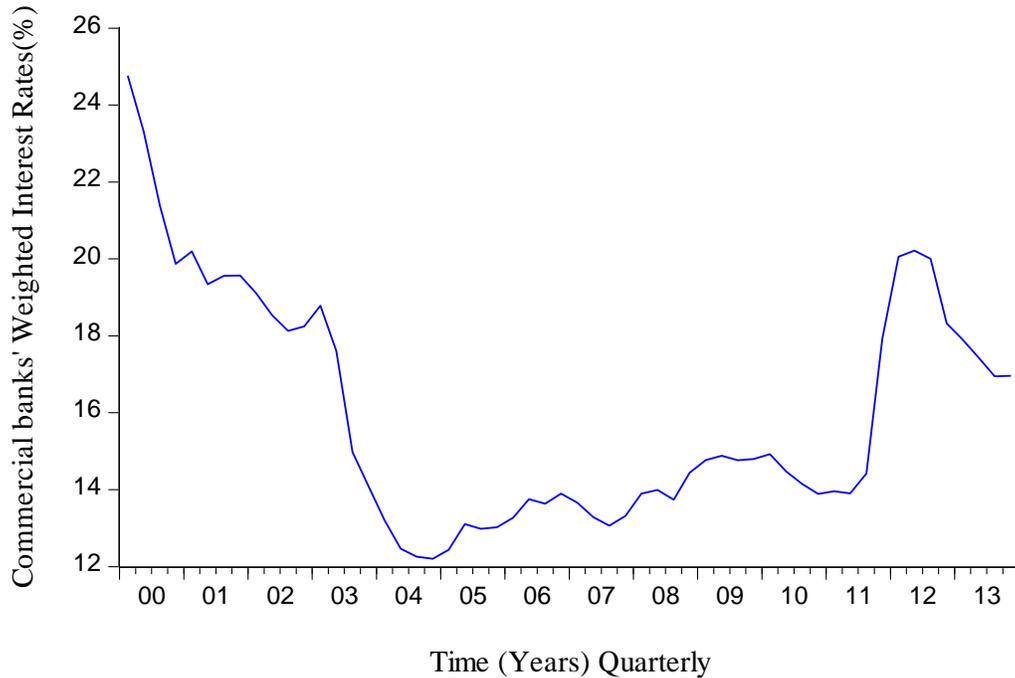
**Figure 4.1: Logarithm of Construction Output (2001 Kshs.) (2000 - 2013) Quarterly**

**Source:** Author, (2016)

#### 4.2.2 Commercial Banks' Weighted Interest Rates

This interest rate was highest in the year 2000 when it reached 24.76%. It then started dropping steadily to 12.2% in 2004. This is a difference of more than 50% in less than five years. However towards the end of 2004, the rate began to go up very mildly, though with some fluctuations. Over the whole period from 2000 to 2013, the behavior of this variable presented itself as a U-shaped graph. The lowest level of the interest rate was reached in the year 2004. This scenario is exhibited in figure 4.2.

The raw data of this variable is shown in appendix A.



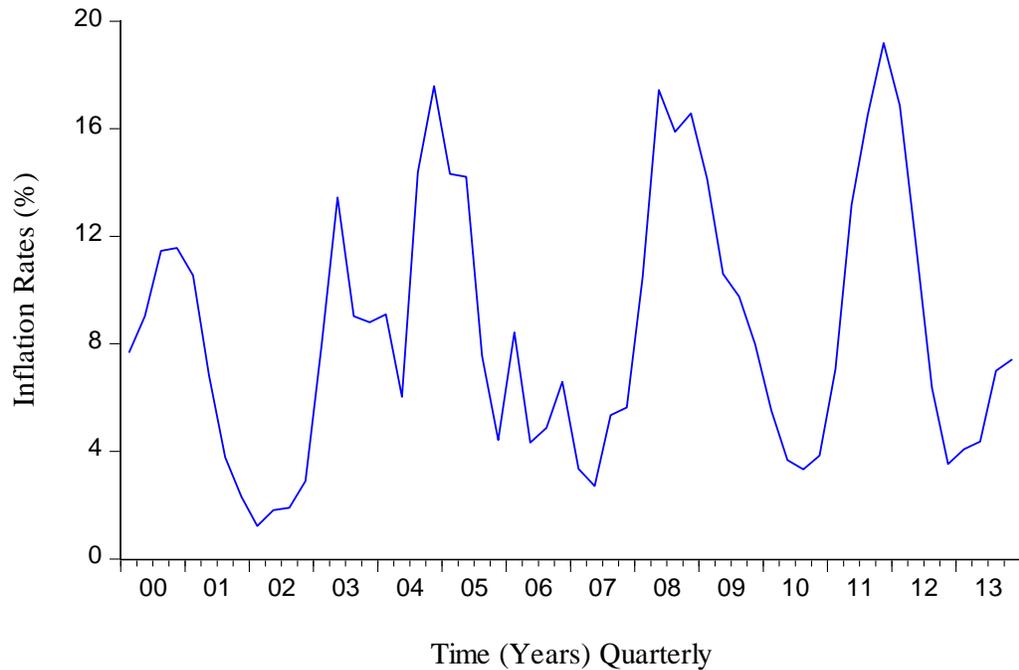
**Figure 4.2: Commercial Banks' Weighted Interest Rates**

**Source:** Author, (2016)

### 4.2.3 Inflation Rates

After graphical analysis of the data in table 4.3, inflation rate appeared to fluctuate heavily over the whole period from year 2000 to year 2013. The lowest of this rate occurred in the first quarter of 2002 and the highest happened in the last quarter of 2012. The rates were 1.2% and 19.1% respectively. The behavior of inflation rate over the whole period in question is given in figure 4.3.

See appendix A for the raw data of this variable.



**Figure 4.3: Inflation Rates**

Source: **Author, (2016)**

#### 4.2.4 Exchange Rates

As can be observed from figure 4.4, the Kenya shilling to US dollar operated between Kshs. 62.6 and Kshs. 93.86. The former being the lowest and the latter being the highest. The lowest rate happened towards the end of the second quarter of 2008. However the highest exchange rate occurred in the last quarter of 2011. From the beginning of the year 2000, the rate was rising very mildly with a bit of fluctuations up to the beginning of 2005. The rate then started dropping sharply up to the middle of 2008. From 2008 to 2009, there was a very sharp increase of the exchange rate. It then dropped shortly, and then it took a sharp rise up to around 2012 when it started reducing slowly. The behavior of this variable is exhibited in figure 4.4.

Appendix A shows the raw data of this variable.

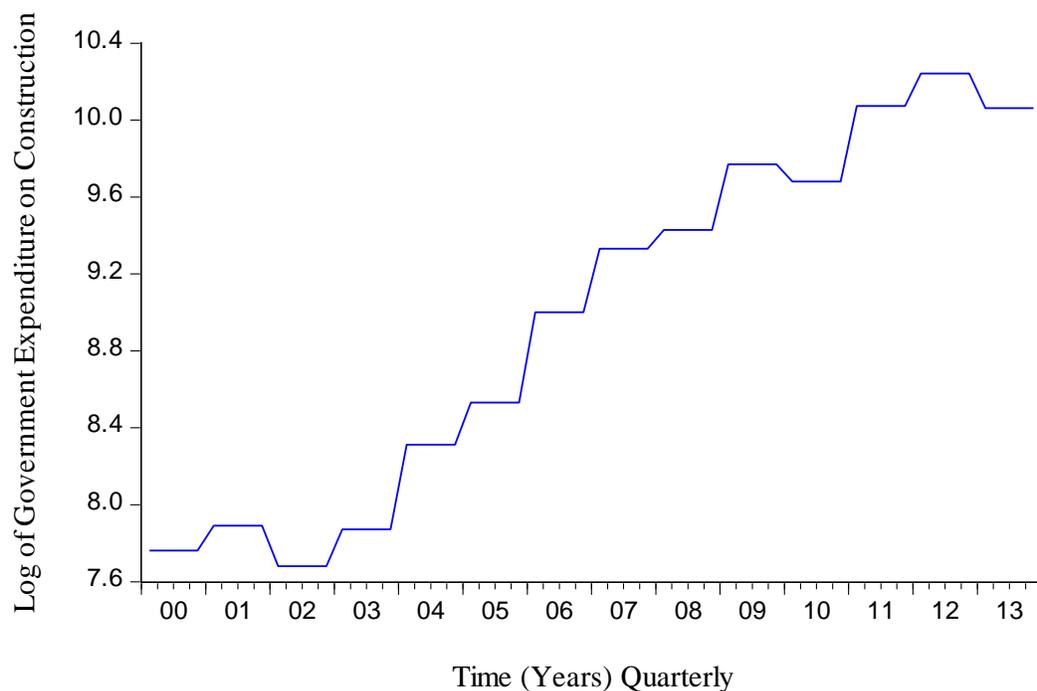


**Figure 4.4: Exchange Rates**

**Source:** Author, (2016)

#### **4.2.5 Government Expenditure on construction**

Government expenditure on construction has been increasing from the year 2000 to the year 2013. This trend is an indication that the government's projects have been increasing year by year except in 2002 when there was a small decline. The lowest expenditure on construction by the government over this period was Kshs. 9.695 billion and the highest was Kshs. 28.079 billion. This occurred in 2002 and 2012 respectively. From the observation of figure 4.5, it can be seen that the government of Kenya allocates some increased finances to construction projects every year. The figure overleaf displays this scenario. For the raw data of the variable, see appendix A.

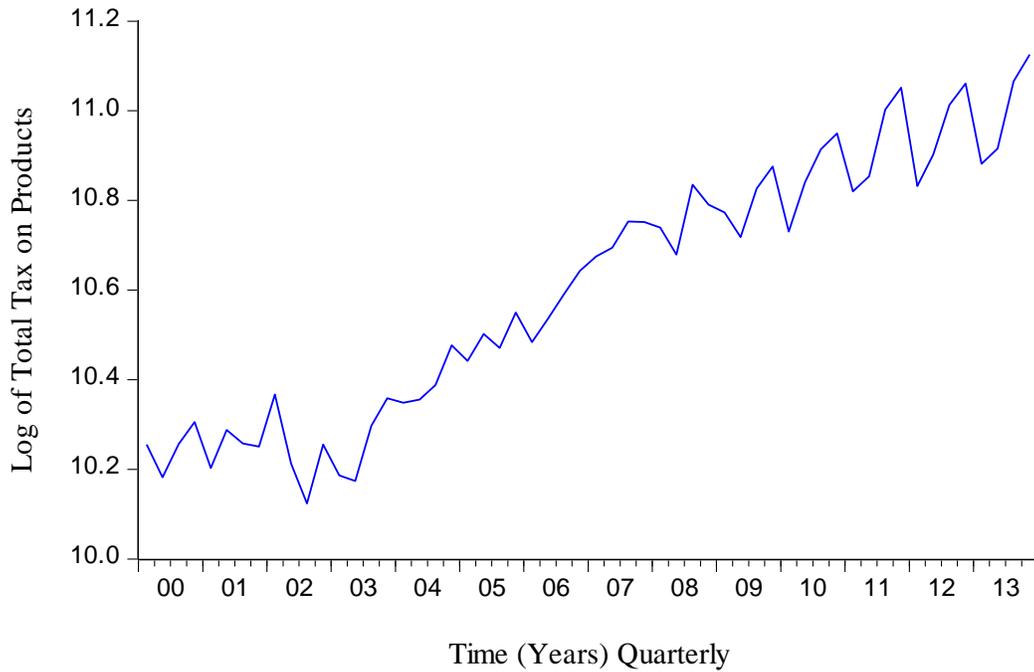


**Figure 4.5: Logarithm of Government Expenditure on Construction**

**Source:** Author, (2016)

#### 4.2.6 Total Tax on Products

From figure 4.6, tax collection from products has been increasing over the whole period except in 2002 when there was a sharp decrease. The tax collection started from then, to increase gradually over the period between the years 2002 to 2013. The highest amount of this collection was reached in 2013 and the lowest was reached in 2002. The highest was Kshs. 67.884 billion and the lowest was Kshs. 24.921 billion respectively. There were fluctuations in collection of this tax but above all, it maintained an upward trend over the whole period under consideration. Figure 4.6 overleaf shows this trend. The raw data for Total tax on construction is included in appendix A.



**Figure 4.6: Logarithm of Total Tax on Products**

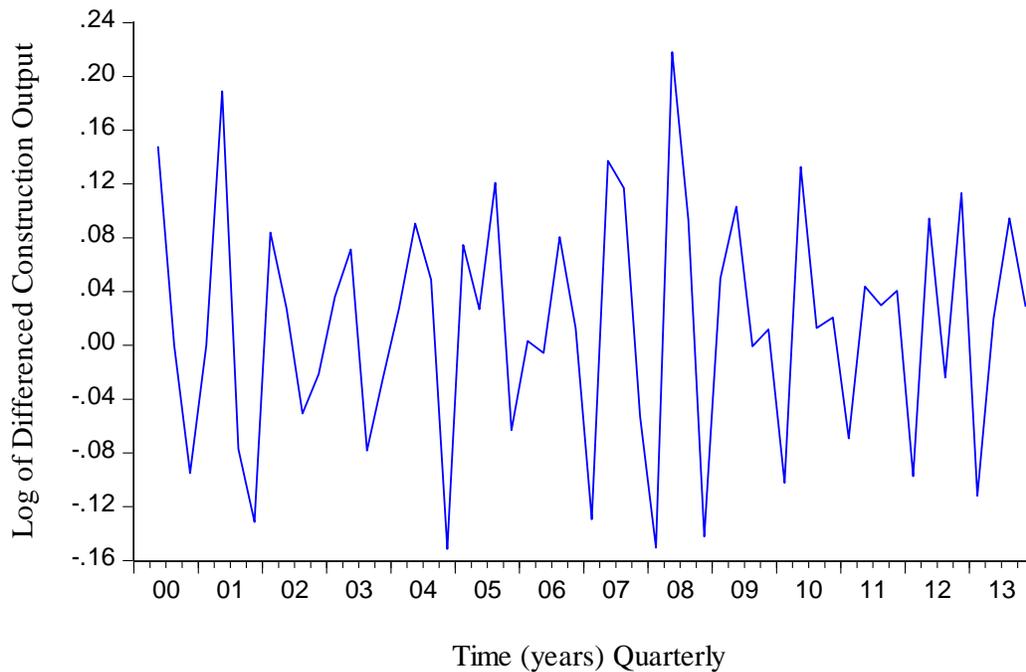
**Source:** Author, (2016)

### 4.3 Tests of Stationarity

The economic time series data were tested for stationarity as the first step towards time series regression. It preceded other tests which were carried out on the same data due to the assumption that time series data is stationary before further tests are carried out as seen in Gujarati & Porter, (2009). For that particular reason, the process of analyzing the data in this study started with the test for stationarity to avoid spurious regression. The stationarity tests involved first differences, correlogram and unit root tests for each variable in the study. The three methods of stationarity tests were carried out on the data due to the importance attached to stationarity by time series regression analysis. The whole process of how the stationarity tests were carried out is now discussed.

### 4.3.1 Construction Output

The values of construction output had heteroscedasticity problem and therefore, natural logarithmic transformation was carried out to reduce the problem. The first differences of these construction output values were therefore transformed into logarithmic form and plotted on a graph which was observed to indicate stationarity. These results are shown in figure 4.7.



**Figure 4.7: Natural Log of Differenced Construction Output**

**Source:** Author, (2016)

Unit root and correlogram tests were also done on the construction output. These tests did not show different results from the ones indicated on figure 4.7. The correlogram and unit root test results are as shown in table 4.1 and table 4.2 respectively. From the correlogram table 4.1, it can be observed that , most of the values at different lags are

tending to zero. This a a stationarity indication. This is obseved in the columns labelled “Autocorrelation” and “AC” in the table.

**Table 4.1: Correlogram of First Differences of Construction Output**

**Sample: 2000Q1 2013Q4**

**Included observations: 55**

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	-0.306	-0.306	5.4435	0.020
		2	-0.376	-0.518	13.802	0.001
		3	-0.036	-0.557	13.880	0.003
		4	0.519	0.065	30.459	0.000
		5	-0.078	0.213	30.842	0.000
		6	-0.313	0.198	37.096	0.000
		7	-0.042	0.045	37.213	0.000
		8	0.338	0.004	44.854	0.000
		9	-0.009	-0.032	44.859	0.000
		10	-0.167	0.129	46.802	0.000
		11	-0.229	-0.228	50.548	0.000
		12	0.321	-0.165	58.055	0.000
		13	0.139	0.036	59.496	0.000
		14	-0.234	0.042	63.677	0.000
		15	-0.171	0.143	65.957	0.000
		16	0.170	-0.056	68.283	0.000
		17	0.213	-0.062	72.014	0.000
		18	-0.138	0.072	73.639	0.000
		19	-0.248	-0.008	78.987	0.000

**Source:**

Author, (2016)

Unit root test on this variable showed stationarity of the data. The null hypothesis that the first difference of construction output had a unit root was not accepted. Hence the first differences of construction output was stationary at 95% level of confidence. See table 4.2.

**Table 4.2: Unit Root Test of First Difference for Construction Output**

---

**Null Hypothesis: First Difference of Construction Output has a unit root**

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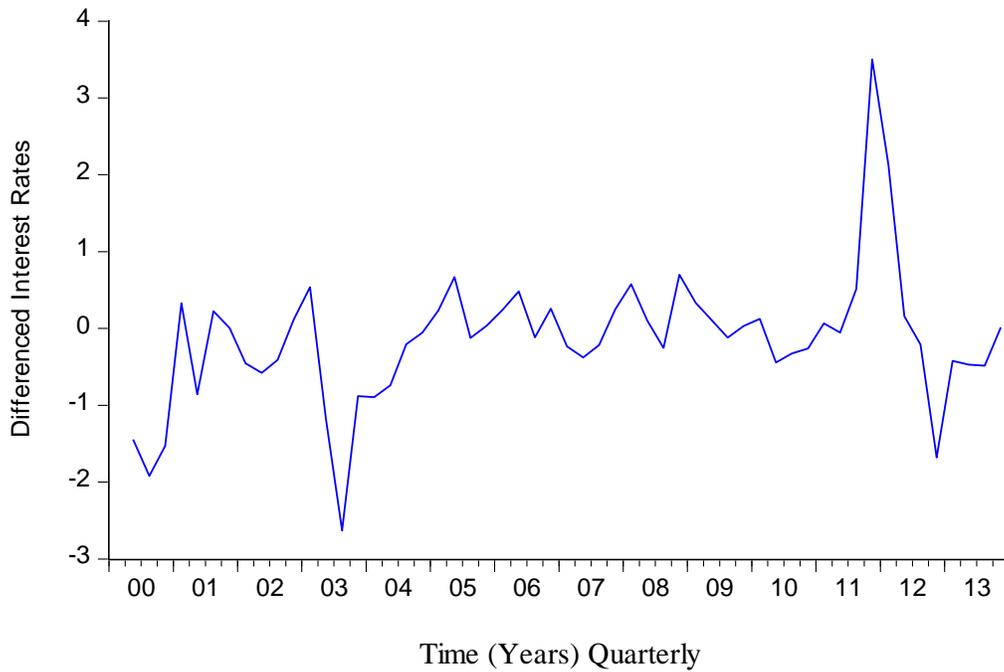
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-13.33923	0.0000
Test critical values: 1% level	-4.144584	
5% level	-3.498692	
10% level	-3.178578	

---

**Source:** Author, (2016)

### **4.3.2 Commercial Banks' Weighted Interest Rates**

The variable was homoscedastic and therefore there was no need of logarithmic transformation. The first differences of this variable was stationary as observed from the graph shown on figure 4.8.



**Figure 4.8: Differenced Commercial Banks' Weighted Interest Rate**

**Source:** Author, (2016)

Correlogram of the variable displayed similar results. This is shown in table 4.3. In the column indicated “Autocorrelation” and the other indicated “AC”, the results can be observed showing stationarity of the variable.

**Table 4.3: Correlogram of First Differences of Commercial Banks Weighted Interest Rates**

Sample: 2000Q1 2013Q4

Included observations: 55

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.524	0.524	15.917	0.000
		2	0.151	-0.170	17.261	0.000
		3	-0.009	-0.017	17.266	0.001
		4	-0.112	-0.105	18.043	0.001
		5	-0.078	0.052	18.427	0.002
		6	-0.078	-0.081	18.818	0.004
		7	-0.052	0.020	18.997	0.008
		8	0.052	0.090	19.177	0.014
		9	0.018	-0.090	19.199	0.024
		10	-0.010	0.006	19.206	0.038
		11	0.134	0.209	20.484	0.039
		12	0.261	0.157	25.432	0.013
		13	0.169	-0.109	27.574	0.010
		14	0.107	0.090	28.449	0.012
		15	0.127	0.154	29.709	0.013
		16	0.033	-0.116	29.798	0.019
		17	-0.042	-0.028	29.944	0.027
		18	-0.155	-0.080	31.991	0.022
		19	-0.131	0.037	33.476	0.021

Source: Author, (2016)

At 95% level of confidence, the null hypothesis that commercial banks' weighted interest rates has a unit root was not accepted. Therefore, the first differences of commercial banks' weighted interest rates were stationary. Table 4.4 displays these results. The P-value is 0.0061 and hence rejecting the null hypothesis.

**Table 4.4: Unit Root Test for First Differences of Commercial Banks Weighted Interest Rate**

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**Null Hypothesis: First Differences of Commercial Banks' Weighted Interest Rate has a unit root**

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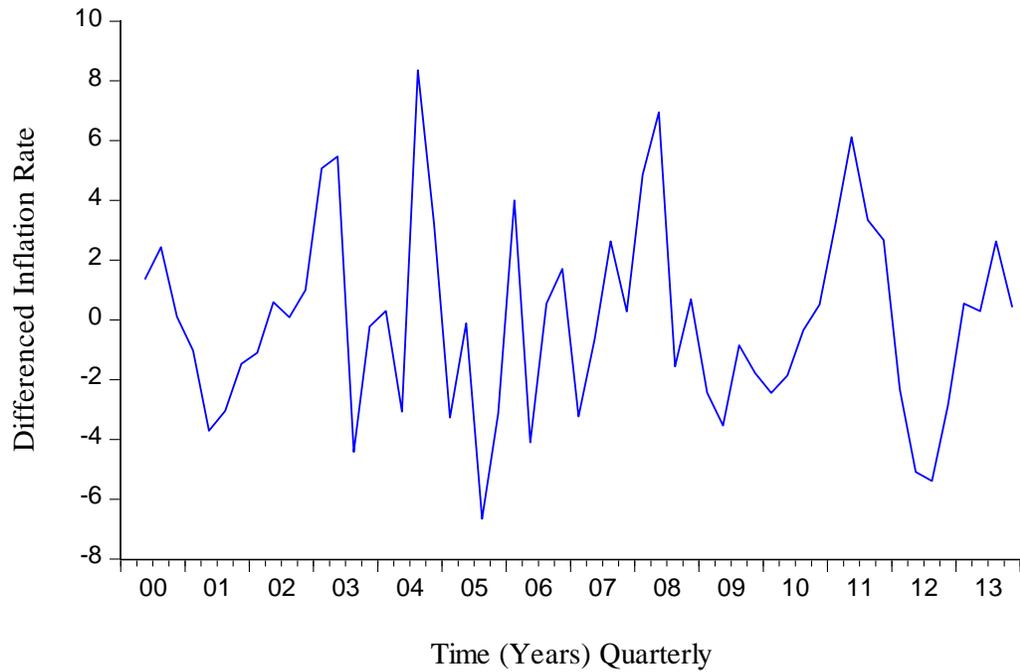
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.314288	0.0061
Test critical values: 1% level	-4.137279	
5% level	-3.495295	
10% level	-3.176618	

---

**Source:** Author, (2016)

### **4.3.3 Inflation Rate**

This variable once again had no problem of heteroscedasticity. Therefore, logarithmic transformation was not necessary for this variable. Its first differences were also found to be stationary as can be observed from the graph plotted below in figure 4.9.



**Figure 4.9: Differenced Inflation Rate**

**Source:** Author, (2016)

Correlogram test also exhibited similar results as observed in the table 4.5. The Autocorrelation and AC columns in the table indicate the data stionarity for this variable. In the AC column, the values are tending to zero which means stationarity of the data.

**Table 4.5: Correlogram of First Differences of Inflation Rate**

Sample: 2000Q1 2013Q4

Included observations: 55

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.271	0.271	4.2656	0.039
		2	0.012	-0.066	4.2741	0.118
		3	0.039	0.058	4.3638	0.225
		4	-0.558	-0.635	23.491	0.000
		5	-0.239	0.216	27.085	0.000
		6	0.054	0.000	27.273	0.000
		7	-0.268	-0.309	31.964	0.000
		8	-0.023	-0.314	31.998	0.000
		9	0.045	0.029	32.134	0.000
		10	-0.254	-0.218	36.619	0.000
		11	0.091	-0.135	37.213	0.000
		12	0.145	-0.208	38.755	0.000
		13	-0.012	0.010	38.766	0.000
		14	0.305	-0.033	45.863	0.000
		15	0.157	-0.089	47.783	0.000
		16	-0.096	-0.223	48.518	0.000
		17	0.018	-0.187	48.544	0.000
		18	-0.132	-0.012	50.024	0.000
		19	-0.084	0.146	50.637	0.000

**Source:** Author, (2016)

Similar results were also obtained from a unit root test which was carried out at 95% level of confidence. This is as seen in table 4.6 which displays the results of this test. The P-value is less than ( $\alpha = 0.05$ ) and hence the null hypothesis that first difference of inflation rate has a unit root is strongly rejected.

**Table 4.6: Unit Root Test for First Difference of Inflation Rate**

---

**Null Hypothesis: First Difference of Inflation Rate has a unit root**

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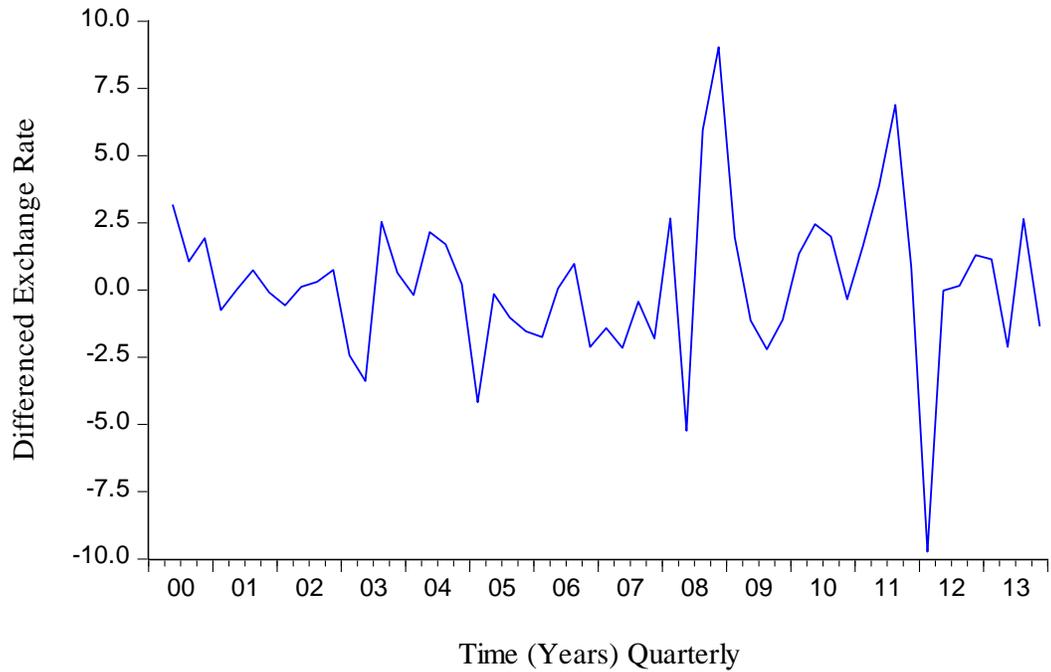
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.586900	0.0032
Test critical values: 1% level	-4.165756	
5% level	-3.508508	
10% level	-3.184230	

---

**Source:** Author, (2016)

#### **4.3.4 Exchange Rates**

The Kenya shilling to US dollar exchange rate did not appear to have heteroscedasticity problem. Therefore , it was not necessary to transform it to logarithmic form. Its first difference was found to be stationary. Figure 4.10 displays these results.



**Figure 4.10: Differenced Exchange Rate**

**Source:** Author, (2016)

Exchange rate correlogram test shows that the first differences of this variable are stationary. The values in the column named “AC” are tending to zero which is a stationarity indication. This scenario is explained by table 4.7.

**Table 4.7: Correlogram of First Differences of Exchange Rate**

**Sample: 2000Q1 2013Q4**

**Included observations: 55**

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.149	0.149	1.2810	0.258
		2	-0.184	-0.211	3.2917	0.193
		3	-0.168	-0.111	4.9906	0.172
		4	-0.036	-0.031	5.0718	0.280
		5	0.103	0.066	5.7425	0.332
		6	-0.075	-0.142	6.0996	0.412
		7	-0.050	0.006	6.2609	0.510
		8	-0.035	-0.050	6.3428	0.609
		9	0.074	0.063	6.7119	0.667
		10	0.174	0.127	8.8125	0.550
		11	0.153	0.156	10.473	0.488
		12	-0.076	-0.073	10.896	0.538
		13	-0.287	-0.194	17.061	0.197
		14	-0.188	-0.138	19.758	0.138
		15	0.030	-0.028	19.830	0.179
		16	-0.028	-0.165	19.893	0.225
		17	0.078	0.120	20.398	0.254
		18	-0.003	-0.039	20.399	0.311
		19	-0.034	-0.058	20.499	0.365

**Source:** Author, (2016)

Unit root test confirmed that indeed the variable's data was stationary in its first differences. The hypothesis that the first difference of exchange rate had a unit root was rejected since the P-value is less than ( $\alpha = 0.05$ ). These results are displayed in table.

**Table 4.8: Unit Root Test for First Difference of Exchange Rate**

---

**Null Hypothesis: First Difference of Exchange Rate has a unit root**

---

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.216290	0.0000
Test critical values:		
1% level	-4.137279	
5% level	-3.495295	
10% level	-3.176618	

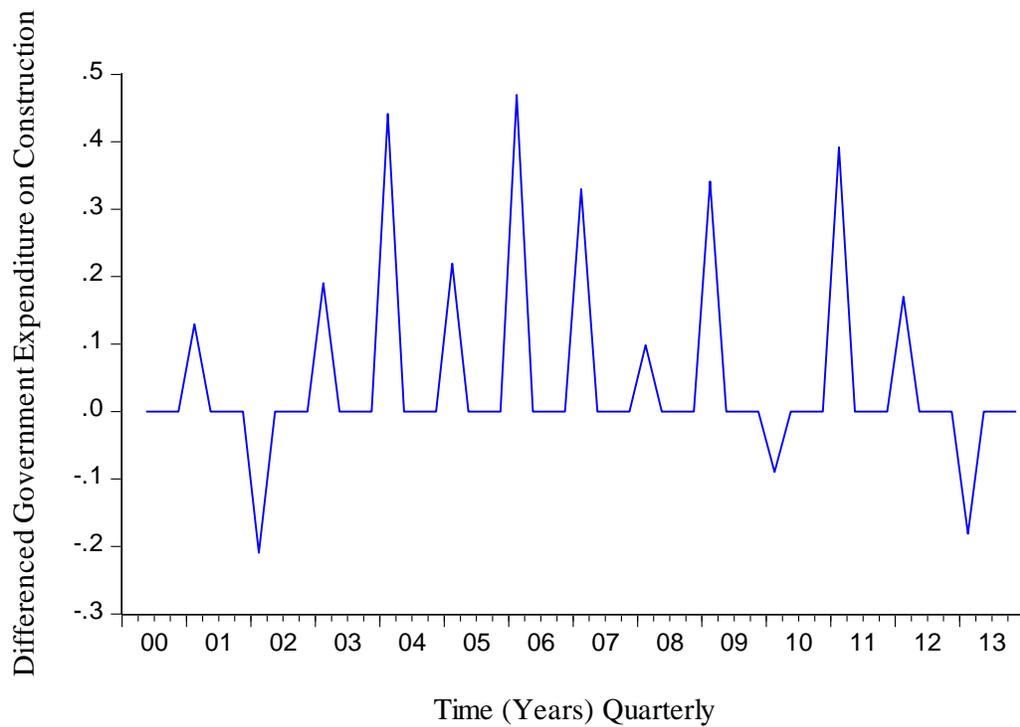
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**Source:** Author, (2016)

The test was carried out at 95% level of confidence.

#### **4.3.5 Government Expenditure on Construction**

This variable was found to be extremely heteroscedastic and hence the need for natural logarithmic transformation to reduce this problem. The first difference of this variable was stationary and this is as seen in figure 4.11.



**Figure 4.11: Natural Log of Differenced Government Expenditure on Construction**

**Source:** Author, (2016)

Correlogram test of the variable still showed that the variable was stationary by giving autocorrelation values which are very close to zero. Table 4.9 overleaf gives these results.

**Table 4.9: Correlogram of First Differences of Government Expenditure on Construction**

Sample: 2000Q1 2013Q4

Included observations: 55

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	-0.057	-0.057	0.1897	0.663
		2	-0.058	-0.062	0.3899	0.823
		3	-0.059	-0.067	0.6012	0.896
		4	0.055	0.044	0.7849	0.940
		5	-0.073	-0.075	1.1168	0.953
		6	-0.074	-0.082	1.4651	0.962
		7	-0.075	-0.090	1.8306	0.969
		8	0.086	0.055	2.3243	0.969
		9	-0.066	-0.074	2.6254	0.977
		10	-0.067	-0.080	2.9428	0.983
		11	-0.069	-0.088	3.2773	0.987
		12	0.341	0.303	11.731	0.468
		13	-0.049	-0.032	11.910	0.535
		14	-0.050	-0.033	12.100	0.598
		15	-0.051	-0.034	12.304	0.656
		16	0.006	-0.058	12.306	0.723
		17	-0.053	-0.034	12.539	0.766
		18	-0.054	-0.035	12.787	0.804
		19	-0.055	-0.035	13.052	0.836

**Source:** Author, (2016)

The unit root test showed that still, the variable's series data was stationary by rejecting the null hypothesis that the first difference of this variable had a unit root. Table 4.10 displays these results. The p-value is zero which is an indication of strong rejection of the null hypothesis.

**Table 4.10: Unit Root Test of the First Difference of Government Expenditure on construction**

---

**Null Hypothesis: First Difference of Government Expenditure on Construction has a unit root**

---

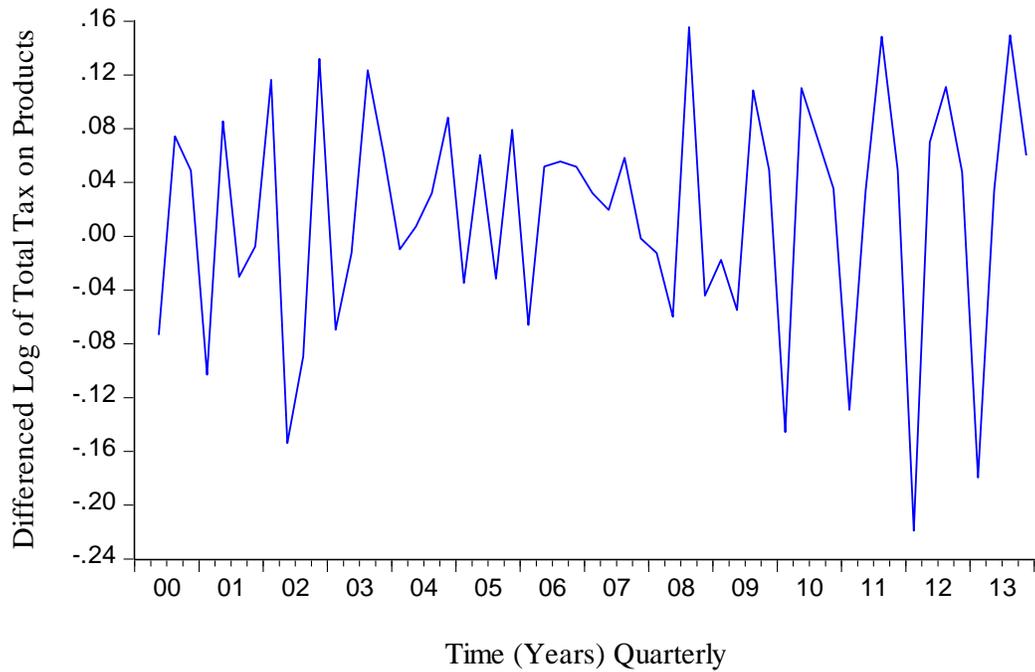
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.585495	0.0000
Test critical values:	1% level	-4.137279	
	5% level	-3.495295	
	10% level	-3.176618	

---

**Source:** Author, (2016)

#### **4.3.6 Total Tax on Products**

Due to its heteroscedastic problem, natural logarithmic transformation had to be carried out to reduce this problem. Differencing was then done and the first differences of this variable's data were found to be stationary. See graph in figure 4.12.



**Figure 4.12: Natural Log of Differenced Total Tax on Products**

**Source:** Author, (2016)

The correlogram test of the variable also gave results of stationarity for total tax on products. The correlogram test results are given in table 4.11. The autocorrelation values are very close to zero. Therefore the data for this variable was considered to be stationary.

**Table 4.11: Correlogram of First Differences of Total Tax on Products**

**Sample: 2000Q1 2013Q4**

**Included observations: 55**

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	-0.167	-0.167	1.6220	0.203
		2	-0.523	-0.567	17.801	0.000
		3	-0.050	-0.427	17.953	0.000
		4	0.569	0.218	37.857	0.000
		5	0.001	0.153	37.857	0.000
		6	-0.473	-0.074	52.148	0.000
		7	-0.050	-0.094	52.310	0.000
		8	0.437	0.010	65.028	0.000
		9	0.020	-0.032	65.057	0.000
		10	-0.391	-0.075	75.686	0.000
		11	0.048	0.134	75.848	0.000
		12	0.251	-0.059	80.426	0.000
		13	0.064	0.067	80.732	0.000
		14	-0.335	-0.077	89.320	0.000
		15	0.125	0.178	90.550	0.000
		16	0.150	-0.016	92.357	0.000
		17	-0.030	-0.019	92.429	0.000
		18	-0.183	0.028	95.257	0.000
		19	0.008	-0.174	95.262	0.000

**Source:** Author, (2016)

Unit root test for this variable gave a p-value of zero. This means that the null hypothesis, that total tax on products has a unit root is strongly rejected. These results are displayed in table 4.12.

**Table 4.12: Unit Root Test for First Difference of Total Tax on Products**

---

**Null Hypothesis: First Difference of Total Tax on Products has a unit root**

---

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.64886	0.0000
Test critical values:	1% level	-4.144584	
	5% level	-3.498692	
	10% level	-3.178578	

---

**Source:** Author, (2016)

#### **4.3.7 Observations on Stationarity tests**

In ensuring that the data used in this research were stationary, a number of stationarity tests were carried out. This was very important because time series regression relies heavily on stationarity of the data in order to avoid spurious regression. The tests used the first differences of the data and conclusions based on each test are discussed.

##### **Autocorrelation Functions (ACF) and Correlogram Test**

The autocorrelation functions show stationarity as observed in the column indicated AC in all the tables; 4.1, 4.3, 4.5, 4.7, 4.9 and 4.11. The values in the column are very small and most of them tended to zero which is a sign of stationarity. This scenario was exhibited in all the six variables as observed in their correlogram tables as stated earlier.

##### **Augmented Dickey-Fuller (ADF) Unit Root Test**

This is a very powerful tool for testing data stationarity. It confirmed that the deductions drawn from the first two tests were indeed correct in that the data was stationary. Therefore the conclusions drawn were:

- The first differences of all the variables were stationary
- Augmented Dickey-Fuller test (ADF) showed that all the first differences of the variables had no unit roots. All the p-values were very close to zero. This had an indication that no variable had a unit root and hence they were all stationary after differencing once.

Tables 4.2, 4.4, 4.6, 4.8, 4.10 and 4.12 display these results. It is an implication that all the variables were integrated of order 1 which meant that they were all random walks. All the p-values in all the tables are less than ( $\alpha = 0.05$ ) and therefore the null hypotheses that – the first differences had unit roots were not accepted. The first differences of all the variables were consequently considered to be stationary.

#### **4.4 Coefficients of Correlation amongst the Stationary Series of Variables**

The coefficients of correlation were computed and the results obtained were as shown in table 4.13. The relationships amongst all the stationary variables were considered here. The main purpose of the computation was to find out/ establish whether there is correlation amongst the stationary variables which include the dependent variable – construction output and the following independent variables:

1. Commercial banks weighted interest rates (CBWR)
2. U.S dollar to Kenya shilling exchange rate (ER)
3. Inflation rate (IR)
4. Total tax on products (TTP)
5. Government expenditure on construction (GEC)

The independent variables are the factors of fiscal and monetary policy that influence construction output.

**Table 4.13: correlation Coefficients (r)**

	<b>DLOG(CO)</b>	<b>D(CBWR)</b>	<b>D(ER)</b>	<b>D(IR)</b>	<b>DLOG(GEC)</b>	<b>DLOG(TTP)</b>
<b>DLOG(CO)</b>	1.000000					
<b>D(CBWR)</b>	-0.146463	1.000000				
<b>D(ER)</b>	-0.100243	-0.201952	1.000000			
<b>D(IR)</b>	0.020790	0.107491	0.079127	1.000000		
<b>DLOG(GEC)</b>	-0.111793	0.141586	-0.183602	0.084045	1.000000	
<b>DLOG(TTP)</b>	<b>0.221628</b>	<b>-0.226689</b>	<b>0.333454</b>	<b>-0.079328</b>	<b>-0.278586</b>	<b>1.000000</b>

**Source:** Author, (2016)

The relationships amongst the stationary series of the variables are now amplified under the heading of each variable.

#### **4.4.1 Construction Output**

This is the main focus since the research intention is to establish whether it is influenced by other variables. From table 4.13 above, construction output is directly correlated to only two stationary explanatory variables. The explanatory variables are inflation rate and total tax on products. The construction output is inversely correlated to commercial banks weighted interest rate with a correlation coefficient of  $r = -0.1465$ . Correlation coefficients of construction output and the rest of the variables are as follows:

- (1) Exchange rate  $r = -0.100$
- (2) Inflation rate  $r = 0.0208$
- (3) Total tax on products  $r = 0.2216$
- (4) Government expenditure on construction  $r = -0.1118$

#### **4.4.2 Commercial Banks Weighted Interest Rate**

This is inversely correlated to two variables which include differenced exchange rate,  $r = -0.202$  and for natural logarithm of first differences of total tax on products,  $r = -0.2267$ . The other coefficients for the other two variables are,  $r = 0.1075$  for inflation rate, and  $r = 0.1416$  for government expenditure on construction. The coefficients of correlation are very low as can be observed from table 4.13.

#### **4.4.3 U.S Dollar to Kenya Shilling Exchange Rate**

Though directly correlated to most of the variables, the correlation coefficients are quite low. The coefficients for these stationary variables are given as,  $r = -0.1836$  for government expenditure on construction,  $r = -0.1002$  for construction output,  $r = 0.3335$  for total tax on products,  $r = -0.202$  for commercial banks weighted interest rate and lastly,  $r = 0.0791$  for inflation rate.

#### **4.4.4 Inflation rate**

The correlation coefficients appear to be extremely low for this variable and other variables. Inflation rate is directly correlated to four variables. The strength of these relationships is as follows:

1. Between the inflation rate and construction output is  $r = 0.0208$

2. Between the inflation rate and commercial banks weighted interest rate is  $r = 0.1075$ .
3. Between the inflation rate and exchange rate is  $r = 0.0791$ .
4. Between the inflation rate and total tax on products is  $r = -0.0793$ .
5. Between the inflation rate and government expenditure on construction is  $r = 0.0840$ .

#### **4.4.5 Total Tax on Products**

This variable is inversely correlated to commercial banks weighted interest rates. It exhibits direct and indirect correlation with the rest of the variables, though with very low coefficients in general. These coefficients of correlation are  $r = 0.2216$  between itself and construction output,  $r = -0.2267$  between itself and commercial banks weighted interest rate,  $r = 0.3335$  between total tax on products and exchange rate,  $r = -0.0793$  between the total tax on products and inflation rate and lastly  $r = -0.2786$  between the total tax on products and government expenditure on construction.

#### **4.4.6 Government expenditure on construction**

Very low indirect correlations are witnessed here, between the government expenditure and construction output and total tax on products. They exhibit  $r = -0.1118$  and  $r = -0.2786$  respectively. Commercial banks weighted interest rate is positively correlated to the government expenditure on construction with a correlation value of  $r = 0.1416$ . The rest which include exchange rate and inflation rate are inversely and directly correlated to the government expenditure on construction. Their correlation values stand at  $r = -0.1836$  and  $r = 0.0840$  respectively.

### **4.5 Regression of Construction Output on Explanatory Variables**

The purpose of the regression was to find out the impact explanatory variables have on

construction output in Kenya. The regression had the principal aim of testing the null hypothesis that  $\beta = 0$  for all the  $\beta_i$  which implies that the explanatory variables in the regression model have no influence on construction output in Kenya.

In this section therefore, results are presented from the multiple regression of construction output. During the multiple regression analysis, natural logarithm of differenced construction output (CO) was regressed on Commercial Banks' Weighted Interest Rate (CBWR), Inflation Rate (IR), Kenya Shilling to U.S Dollar Exchange Rate (ER), natural logarithm of government of Kenya Expenditure on Construction (GEC) and Total Tax on Products in Kenya. These explanatory variables were first differenced to ensure they were stationary. They were the only explanatory variables whose data were adequately available for the whole period of study; 2000 to 2013. 2014 data could not be included since the government had started the process of rebasing from 2001 to 2009. Therefore, the data for 2014 had been affected by the rebasing process. In this regression, the construction output used was the formal construction output from the year 2000 to 2013. The sample data for the explanatory variables used was also for the same period; 2000 to 2013. Significance level ( $\alpha$  level) which was used to test the

regression coefficients was 0.05. All the explanatory variables, namely, Kenya Shilling to the U.S Dollar Exchange Rate, Commercial Banks Weighted interest Rate (CBWR), Inflation Rate (IR), government of Kenya expenditure on construction, total tax on products (TTP) and the construction output which was the dependent variable, were non-stationary. Therefore, data transformation had to be carried out as seen in section 4.3 of this chapter.

The regression analysis which was carried out applied the following equation:

$$CO_t = \alpha + \beta_1 CBWR_t + \beta_2 IR_t + \beta_3 ER_t + \beta_4 TTP_t + \beta_5 GEC_t + \varepsilon_t \dots \dots \dots (1)$$

- Where: CO = Construction Output  
CBWR = Commercial Bank' Weighted Interest Rates  
IR = Inflation Rates  
ER = Kenya shilling per US dollar Exchange Rate  
GEC = Government Expenditure on Construction  
TTP = Total Tax on Construction  
 $\beta$  = Regression Coefficient  
 $\alpha$  = Intercept (This is the value of construction output when all the

independent variables are set at zero).

- $\varepsilon$  = Error Term or Residual  
t = Specific Quarter year

And the results obtained were displayed in table 4.14. The time series regression analysis method was used for this regression due to the time series nature of the data. The full regression output table is appended in appendix E.

**Table 4.14: Multiple Regression Results**

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012671	0.013038	0.971803	0.3359
D(CBWR)	0.013362	0.014056	-0.950605	0.3465
D(ER)	0.007219	0.004558	-1.583793	0.1197
D(IR)	0.002176	0.003747	0.580677	0.5641
DLOG(GEC)	0.048161	0.096185	-0.500708	0.6188
DLOG(TTP)	0.262487	0.153647	1.708373	0.0939
R-squared	0.108969			

---

**Source:** Author, (2016)

From table 4.14 above, the coefficients of regression for each explanatory variable are now obtained. The coefficients are:

- 0.01 for the first difference of commercial banks weighted interest rate (CBWR).
- 0.01 for the first difference of U.S dollar to Kenya shilling exchange rate (ER)
- 0.00 for first difference of inflation rate (IR)
- 0.05 for first difference of logarithm of government expenditure on construction (GEC)
- 0.26 for first difference of the logarithm of total tax on products (TTP)

By observing the integers, just from the face value, it can be noticed that the coefficients of CBWR, ER and GEC are negative. This has an implication that the explanatory variables decrease or negatively affect construction output. However, from a priori, GEC is expected to give a positive integer. This is an anomaly, may be caused by the short span of the time series.

On the other hand, and also from a priori, inflation rate and total tax on products are giving a zero and a positive integer respectively. This is still an anomaly which is also caused by short time series.

Based on the results above, construction output can now be given by the following equation:-

$$d\text{LogCO}_t = 0.01 - 0.01 \times d\text{BCWR}_t - 0.01 \times d\text{ER}_t + 0.00 \times d\text{IR}_t - 0.05 \times d\text{logGEC}_t + 0.26 \times d\text{logTTP}_t \dots \dots \dots (2)$$

Where,  $d\text{LogCO}_t = \text{LogCO}_t - \text{LogCO}_{t-1}$  (the first difference of construction output)

$d\text{BCWR}_t = \text{BCWR}_t - \text{BCWR}_{t-1}$  ( first difference of commercial banks rate)

$d\text{ER}_t = \text{ER}_t - \text{ER}_{t-1}$  – (the first difference of exchange rate)

$d\text{IR}_t = \text{IR}_t - \text{IR}_{t-1}$ , (first difference of inflation rate)

$d\text{LogGEC}_t = \text{LogGEC}_t - \text{LogGEC}_{t-1}$  (first difference of Government expenditure on construction)

$d\text{LogTTP}_t = \text{LogTTP}_t - \text{LogTTP}_{t-1}$  (first difference of total tax on products)

The above regression equation can now be expressed in terms of variable levels, as given below:-

$$\text{LogCO}_t - \text{LogCO}_{t-1} = 0.01 - 0.01 \times (\text{BCWR}_t - \text{BCWR}_{t-1}) - 0.01 \times (\text{ER}_t - \text{ER}_{t-1}) + 0.00 \times (\text{IR}_t - \text{IR}_{t-1}) - 0.05 \times (\text{LogGEC}_t - \text{LogGEC}_{t-1}) + 0.26 \times (\text{LogTTP}_t - \text{LogTTP}_{t-1})$$

Putting like terms together and opening up the brackets, the equation becomes:

$$\text{LogCO}_t = 0.01 + \text{LogCO}_{t-1} - 0.01\text{CBWR}_t + 0.01\text{CBWR}_{t-1} - 0.01\text{ER}_t + 0.01\text{ER}_{t-1} - 0.05\text{LogGEC}_t + 0.05\text{LogGEC}_{t-1} + 0.26\text{LogTTP}_t - 0.26\text{LogTTP}_{t-1} \dots \dots \dots (3)$$

The equation above means that, construction output level in a given quarter of a year depends on (i) the level of construction output in the previous quarter year; (ii)

commercial banks weighted interest rate in the current quarter and the previous one quarter, (iii) dollar/shilling exchange rate in the current quarter and the previous one quarter, (iv) inflation rate has no effect and therefore it is dropped, (v) government expenditure on construction in the current quarter and the previous one quarter, (vi) total tax on products in the current quarter and the previous one quarter.

The coefficients of regression are positive for  $CBWR_{t-1}$ ,  $ER_{t-1}$ ,  $LogGEC_{t-1}$ ,  $LogTTP_t$ . This implies that TTP tend to increase construction output in the current quarter and  $CBWR$ ,  $ER$  and  $GEC$  tend to increase construction output in the previous quarter. The findings are contrary to basic economic theory and a priori in chapter II, except  $GEC$  which appeared totally in line with the theories.

On the other hand, coefficients of regression are negative for  $CBWR_t$ ,  $ER_t$ ,  $GEC_t$  and  $TTP_{t-1}$ . Again, this has an implication that  $CBWR$ ,  $ER$  and  $GEC$  tend to decrease construction output in the current quarter.  $TTP$  decreases the construction output in the previous quarter. Except for  $GEC$  which is in the contrary with a priori in chapter II, the other variables are in line with the theories.

As can now be seen, some observations behaved differently from the basic economic theory and a priori explained in chapter II. This anomaly can be attributed to relatively short time series which were used in the regression analysis. It can also be seen that  $R^2 = 0.11$  which is quite low and indicates low explanatory powers for this model.

#### **4.6 Regression of Construction output on Lagged Explanatory Variables**

Having gotten a very low  $R^2$  value in the previous section, the researcher decided to regress construction output on the lagged explanatory variables in a bid to increase the  $R^2$  value.

The researcher arrived at this, after scrutinizing regression results obtained in table 4.14, where it appeared like construction output is greatly influenced by lagged explanatory variables. Due to this reason, it was found necessary to carry out a regression of construction output on lagged explanatory variables. But firstly, correlation analysis of the lagged explanatory variables was done in order to select the lags to be included in

the regression analysis.

#### **4.6.1 Correlation Analysis of Construction output and the lagged Explanatory variables**

Before doing the regression analysis, it was necessary to first carry out a correlation analysis of the lagged explanatory variables in order to select the lags with the highest correlation coefficients which are consistent with a priori knowledge to be included in the regression analysis.

Therefore, construction output was correlated with lagged values of all the explanatory variables and the highest correlation coefficient which was consistent with a priori for each variable was picked. The correlation coefficients for the lagged explanatory variables were as shown in tables 4.15 up to 4.19 below. The variables were lagged up to the 12<sup>th</sup> quarter.

##### **(a) Correlation of the lagged Commercial Banks Weighted Interest Rate (CBWR)**

The highest correlation coefficient between commercial banks weighted interest rate (CBWR) and construction output (CO) which is in line with a priori occurs in lag 0. The correlation coefficient value at this lag is -0.135. This is the lag which was used during regression. See table 4.15 below.

**Table 4.15: Correlation coefficients of First difference of lagged CBWR and logarithm of Construction output (CO)**

	DLOG(CO)
DLOG(CO)	1.000000
<b>D(CBWR)</b>	<b>-0.134954</b>
D(CBWR(-1))	0.099972
D(CBWR(-2))	0.106740
D(CBWR(-3))	-0.118179
D(CBWR(-4))	-0.076721
D(CBWR(-5))	0.018601
D(CBWR(-6))	0.149207
D(CBWR(-7))	-0.035171
D(CBWR(-8))	-0.129433
D(CBWR(-9))	0.189080
D(CBWR(-10))	0.107170
D(CBWR(-11))	0.000968
D(CBWR(-12))	-0.029687

**Source:** Author, (2016)

**(b) Correlation of the Lagged Exchange Rate (ER)**

The table below gives the correlation results of US dollar versus the Kenya shilling exchange rate and construction output in Kenya. From the results, the highest correlation coefficient value is -0.133 occurring at lag 6 and hence the lag was used for regression. This value at this lag is consistent with a priori as seen in section 2.6 of chapter II in this research.

**Table 4.16: Correlation coefficients of First difference of lagged ER and logarithm of Construction output (CO)**

	DLOG(CO)
DLOG(CO)	1.000000
D(ER)	-0.120710
D(ER(-1))	-0.056379
D(ER(-2))	0.071888
D(ER(-3))	-0.037851
D(ER(-4))	0.058498
D(ER(-5))	-0.043966
<b>D(ER(-6))</b>	<b>-0.132861</b>
D(ER(-7))	0.112473
D(ER(-8))	0.012116
D(ER(-9))	-0.091768
D(ER(-10))	-0.118862
D(ER(-11))	0.164656
D(ER(-12))	0.102938

**Source:** Author, (2016)

**(c) Correlation of lagged Inflation Rate (IR)**

The results displayed in table 4.17 were obtained after correlating the lagged values of the first differences of inflation rate and construction output. From the correlation results, it can be observed that the highest value of the coefficients which is consistent with a priori is obtained at lag 7 which was eventually used in the regression analysis. This value is -0.096.

**Table 4.17: Correlation coefficients of First difference of lagged IR and logarithm of Construction output (CO)**

	DLOG(CO)
DLOG(CO)	1.000000
D(IR)	0.025847
D(IR(-1))	-0.055358
D(IR(-2))	-0.037398
D(IR(-3))	0.081407
D(IR(-4))	0.068153
D(IR(-5))	-0.093437
D(IR(-6))	0.032510
<b>D(IR(-7))</b>	<b>-0.096419</b>
D(IR(-8))	-0.081958
D(IR(-9))	0.180523
D(IR(-10))	0.057688
D(IR(-11))	-0.026371
D(IR(-12))	-0.017106

**Source:** Author, (2016)

**(d) Correlation of construction output on lagged Government expenditure on Construction(GEC)**

The logarithm of government expenditure on construction (GEC) was correlated with construction output. The results obtained were as shown in table 4.18. From this table of correlation results, it can be observed that these two variables have their highest value of correlation coefficient at lag 5. This lag was chosen and used for regression analysis.

The value indicates a positive correlation value of 0.388 which is consistent with a priori.

**Table 4.18: Correlation coefficients of First difference of lagged GEC and logarithm of Construction output (CO)**

	DLOG(CO)
DLOG(CO)	1.000000
DLOG(GEC)	-0.119609
DLOG(GEC(-1))	0.265028
DLOG(GEC(-2))	0.132188
DLOG(GEC(-3))	-0.229232
DLOG(GEC(-4))	-0.390930
<b>DLOG(GEC(-5))</b>	<b>0.387817</b>
DLOG(GEC(-6))	0.291282
DLOG(GEC(-7))	-0.203118
DLOG(GEC(-8))	-0.343781
DLOG(GEC(-9))	0.286109
DLOG(GEC(-10))	0.230757
DLOG(GEC(-11))	-0.142152
DLOG(GEC(-12))	-0.361306

**Source:** Author, (2016)

**(e) Correlation of Construction Output on Lagged Total Tax on Products (TTP)**

After correlating the first differences of lagged total tax on products with construction output, the results displayed in table 4.19 were obtained. At lag 1, the highest value of correlation coefficient of- 0.251 was obtained and this lag was consequently used in the

regression analysis. -0.251 was chosen due to its consistency with a priori knowledge.

**Table 4.19: Correlation coefficients of First difference of lagged TTP and logarithm of Construction output (CO)**

	DLOG(CO)
DLOG(CO)	1.000000
DLOG(TTP)	0.259783
<b>DLOG(TTP(-1))</b>	<b>-0.250725</b>
DLOG(TTP(-2))	-0.096766
DLOG(TTP(-3))	0.084043
DLOG(TTP(-4))	0.189646
DLOG(TTP(-5))	-0.084055
DLOG(TTP(-6))	-0.166498
DLOG(TTP(-7))	0.091602
DLOG(TTP(-8))	0.184119
DLOG(TTP(-9))	-0.154697
DLOG(TTP(-10))	0.005496
DLOG(TTP(-11))	0.041639
DLOG(TTP(-12))	0.043448

**Source:** Author, (2016)

The correlation analysis gave the lags of all the explanatory variables which had the highest correlation coefficients and which were also found to be consistent with a priori knowledge as seen in chapter II for inclusion in the regression analysis. The respective lags were identified and the coefficients picked in accordance with a priori and eventually included in the regression equation.

#### **4.6.2 Regression Analysis of Construction Output on Lagged Explanatory Variables**

This sub-section, Presents results from the multiple regression of construction output on lagged monetary and fiscal factors. During the multiple regression analysis, natural logarithm of differenced construction output (CO) was regressed on lagged Commercial Banks' Weighted Interest Rate (CBWR), lagged Inflation Rate (IR), lagged Kenya Shilling to U.S Dollar Exchange Rate (ER), lagged logarithm of government of Kenya Expenditure on Construction (GEC) and lagged logarithm of total tax on products in Kenya (TTP). The significance level ( $\alpha$  level) which was used to test the regression

coefficients was 0.05. All the explanatory variables, namely, lagged Kenya Shilling to the U.S Dollar Exchange Rate, lagged Commercial Banks Weighted interest Rate (CBWR), Lagged Inflation Rate (IR), lagged government of Kenya expenditure on construction and the construction output which was the dependent variable, were non-stationary. Therefore, transformation of the data was carried out as seen in section 4.3 of this chapter. Total tax on products was found to be insignificant and therefore was not included in the regression. The regression analysis was carried out and the results obtained are displayed in table 4.20. Appendix E contains the full regression output table.

**Table 4.20: Regression results for construction output on significant lagged explanatory variables**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
<b>C</b>	0.000108	0.012305	0.008750	0.9931
<b>D(CBWR)</b>	-0.014821	0.013666	-1.084487	0.2841
<b>D(ER(-6))</b>	-0.004381	0.004073	-1.075543	0.2880
<b>D(IR(-5))</b>	-0.002415	0.003560	-0.678414	0.5011
<b>DLOG(GEC(-5))</b>	0.265181	0.086963	3.049334	0.0039
<b>R-squared</b>	0.207491			

**Source:** Author,( 2016)

From table 4.6.6, the coefficients of regression for each lagged explanatory variable are now obtained. The coefficients are:

- 0.015 for the first difference of lagged commercial banks weighted interest rate (CBWR).
- 0.004 for the first difference of lagged U.S dollar to Kenya shilling exchange rate (ER)
- 0.002 for first difference of lagged inflation rate (IR)
- 0.265 for first difference of logarithm of government expenditure on construction (GEC)

Through observation of the integers, just from the face value, it can be noticed that the coefficient of lagged GEC is positive. This has an implication that the lagged

explanatory variable increases or positively affects construction output. This is quite consistent with a priori and therefore, the more government spends on construction the more the output.

All the monetary policy factors affect construction output negatively as seen from table 4.20. These factors are giving results which are consistent with a priori. Therefore, when these rates go up, construction output goes down.

Based on the results above, construction output can now be given by the following equation:-

$$d\text{LogCO}_t = 0.0001 - 0.015 \times d\text{BCWR}_t - 0.004 \times d\text{ER}_{t-6} - 0.002 \times d\text{IR}_{t-5} + 0.265 \times d\text{LogGEC}_{t-5} \dots \dots \quad (4)$$

Where,

$d\text{LogCO}_t = \text{LogCO}_t - \text{LogCO}_{t-1}$  (the first difference of construction output)

$d\text{BCWR}_t = \text{CBWR}_t - \text{CBWR}_{t-1}$  (first difference of lagged commercial banks rate)

$d\text{ER}_{t-6} = \text{ER}_{t-6} - \text{ER}_{t-7}$  (the first difference of lagged exchange rate)

$d\text{IR}_{t-5} = \text{IR}_{t-5} - \text{IR}_{t-6}$  (first difference of lagged inflation rate)

$d\text{LogGEC}_{t-5} = \text{LogGEC}_{t-5} - \text{LogGEC}_{t-6}$  (first difference of lagged Government expenditure on construction)

The above regression equation can now be expressed in terms of variable levels, as given below:-

$$\text{LogCO}_t - \text{LogCO}_{t-1} = 0.0001 - 0.015 \times (\text{BCWR}_t - \text{CBWR}_{t-1}) - 0.004 \times (\text{ER}_{t-6} - \text{ER}_{t-7}) - 0.002 \times (\text{IR}_{t-5} - \text{IR}_{t-6}) + 0.265 \times (\text{LogGEC}_{t-5} - \text{LogGEC}_{t-6})$$

Putting like terms together and opening up the brackets, the equation becomes:

$$\text{LogCO}_t = 0.0001 + \text{LogCO}_{t-1} - 0.015\text{CBWR}_t + 0.015\text{CBWR}_{t-1} - 0.004\text{ER}_{t-6} + 0.004\text{ER}_{t-7} - 0.002\text{IR}_{t-5} + 0.002\text{IR}_{t-6} + 0.265\text{LogGEC}_{t-5} - 0.265\text{LogGEC}_{t-6}$$

And hence, the model that describes construction sector of Kenya in relation to monetary and fiscal policies factors is developed and given as:

$$\text{LogCO}_t = \text{LogCO}_{t-1} - 0.02\text{CBWR}_t + 0.02\text{CBWR}_{t-1} + 0.27\text{LogGEC}_{t-5} - 0.27\text{LogGEC}_{t-6} \dots \dots \dots \quad (5)$$

The equation above means that, construction output level in a given quarter of a year depends on (i) the level of construction output in the previous quarter year; (ii) commercial banks weighted interest rate in the current and last quarter and (iii) government expenditure in the last fifth and sixth quarters. Inflation rate, exchange rate and total tax on products have no effect within first twelve quarters and therefore they were dropped. This model is consistent with a priori knowledge and therefore it is what is happening in the construction industry of Kenya.

#### **4.7 Conclusion**

The variables in this study fall into two categories. The two categories are monetary and fiscal factors. Two monetary policy factors; interest rates and exchange rates exhibit U-shaped graphs. However, inflation rates display a zigzag graph. Construction output and the other two fiscal policy factors maintained an upward trend throughout the period under consideration. Section 4.3 of this chapter gives these results.

In section 4.4 in this chapter, it was found that the correlation amongst the variables exhibited both inverse and positive correlation. Two variables, namely inflation rate and total tax on products displayed positive correlation to construction output. Generally, the correlation coefficients are very low with the highest correlation value being 0.33 between exchange rate and total tax on products.

Kenya's construction output, according to the regression model developed in this study, is influenced by its own past levels. In addition, the past and current levels of commercial banks weighted interest rate have an influence. Past levels of government expenditure on construction have the greatest influence on construction output according this model. The model of multiple regression developed in section 4.6 contain explanatory powers which are higher than those in the previous model in section 4.5. This is explained by the coefficient of determination ( $R^2$ ) which gives a value of 0.21. The earlier  $R^2$  value stood at 0.11 which is a difference of almost 100%.

However, based on the regression analysis, it is observed that commercial bank's weighted interest rates and government expenditure on construction have the greatest

bearing on construction output in the previous quarters. Therefore, it can be confidently concluded that these monetary and fiscal policy factors have effect on construction output. Table 4.20 confirms this since the resultant  $R^2 = 0.21$  after regressing construction output on monetary and fiscal policy factors with lags up to 12<sup>th</sup> quarter.

## **CHAPTER FIVE**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

The aim of this study was to investigate the influence of fiscal and monetary factors on construction output in Kenya for the purpose of using the factors as effective policy instruments to control and manage construction industry output in Kenya. This aim was introduced in chapter I in this study. The path which was followed to investigate the problem was also explained. Relevant literature to this study was reviewed and is discussed in chapter II. The areas discussed included construction output, construction industry, fiscal policy and monetary policies. Then, in chapter III, data collection and analysis methods were presented. This was made to ensure that in this study, the proper research procedures were followed.

A knowledge gap was identified at the end of chapter II which was related to the behavior of construction industry, particularly in Kenya in relation to the fiscal and monetary policies. The study findings were presented in chapter IV indicating how the three objectives of the study as set out in chapter I, were realized in the process of analysis and interpretation of data. Five fiscal and monetary policy factors which influence construction output in Kenya were identified and described, correlation coefficients amongst these factors and construction output were computed and finally, a regression model developed. Each of them produced important information in relation to Kenya's construction industry behavior.

The study findings are now discussed in this chapter in line with this research and literature review. Based on the findings of the study, this chapter presents conclusions as regards to the aim and objectives of the study. The implications of the findings are also discussed for policy and theory of Kenya's construction industry and recommends further research areas. This study, as will be seen, makes a distinctive contribution to construction economics and management body of knowledge in that, players now know the monetary and fiscal policy factors that have effect on construction output levels in

Kenya. Moreover, it is clear that the current levels of construction output are not mostly affected, but it is much so in the past.

## **5.2 Conclusions on the Aim and Objectives**

The study objectives were achieved and hence, the aim of the study as well. The aim of the study was to investigate the influence of fiscal and monetary policy factors on construction output in Kenya for the purpose of using them as effective policy instruments to control and manage construction industry output in Kenya, while the study's specific objectives were:

1. To identify and describe the monetary and fiscal policy factors that influence construction output
2. To compute correlation coefficients amongst the variables
3. To regress construction output on the various monetary and fiscal policy factors that influence construction output.

All the objectives of the study were addressed in chapter IV. The conclusions made in relation to each objective are as discussed below.

### **5.2.1 Graphical Analysis**

Using the study data, graphs for each variable were obtained in relation to trends, minimum and maximum values over the study period. This was addressing the first objective of describing the monetary and fiscal factors which influence construction output in Kenya.

### **5.2.2 Correlation Coefficients amongst the Stationary Variables**

Correlation analysis was carried out. It gave the magnitude of the relationship between the dependent and the explanatory variables. The correlation coefficients which were

computed also showed the relationship amongst all the variables in the study. The time series of the variables which were stationary were as follows:

1. Dependent variable: construction output
2. Independent variables were in two categories as shown below:
  - a. Monetary Policy Factors that Influence Construction Output. These were commercial banks weighted interest rate, inflation rate and U.S dollar to Kenya shilling exchange rate.
  - b. Fiscal policy factors that affect construction output. These were total tax on products in Kenya and government expenditure on construction.

### **5.2.3 Regression of Construction Output on Monetary and Fiscal Policy Factors**

Section 4.5 and 4.6 of chapter IV addressed this objective. Multiple regression models of quarterly construction output and quarterly fiscal and monetary factors in Kenya are developed. Briefly, Kenya's construction output is influenced by its own previous levels, current levels of fiscal and monetary factors and the previous levels of the fiscal and monetary factors. It was also realized that construction output is greatly influenced by lagged monetary and fiscal policy factors as demonstrated in section 4.6 of chapter IV. It is seen here that the  $R^2$  value is almost double of that obtained in section 4.5 of chapter four. This is an indication that construction output is influenced significantly by lagged monetary and fiscal policies in Kenya. The reason behind this is that the effect of the policies is not spontaneous since construction projects take time to complete. However, the explanatory powers of the time series regression model developed in this research are relatively low as compared to those developed in earlier research in the country.

An example of time series regression modeling study of Kenya's construction industry activity is Mbiti,( 2008). The coefficient of determination ( $R^2$  value) observed in this study is lower than ( $R^2$  value) observed in Mbiti, (2008).

The reason for this kind of a difference could be due to the short time series in this study. Mbiti, (2008) stated that: “*in Kenya, modeling annual construction output as a dependent variable explained by other variables is more realistic than modeling the output as a self-projecting variable.*” Therefore in this study, construction output was explained by five (5) variables and hence leaving the above mentioned reason to be the only probable cause for low explanatory powers of the model developed in this study.

#### **5.2.4 Conclusions on the Research Problem**

The research problem investigated in this study as stated in chapter I *is the influences of fiscal and monetary Policies on construction output in Kenya*. These policies are poorly understood and it has not been rigorously proven that these policies really affect the output of construction sector in the country. The fundamental reasons for this are:

- i. Ignorance of monetary and fiscal policy factors among construction sector players in Kenya.
- ii. Lack of adequate knowledge of the impact these factors have on construction output.
- iii. Lack of empirical evidence to show for real that these monetary and fiscal policy factors have an influence on construction output in Kenya.
- iv. Lack of adequate capacity to appropriately appraise construction projects and set aside adequate financial resources and management prior to project commencement.

The study evaluated these policies and identified factors emanating from the two policies. The factors were the independent variables of the study and construction output being the dependent variable. The five factors were namely:

1. Commercial banks weighted interest rate
2. Inflation rate
3. Exchange rate
4. Total tax on products
5. Government expenditure on construction

A research hypothesis was set and eventually tested to establish whether these five (5) factors had an influence on construction output in Kenya. As a result of the hypothesis test, it is found that Kenya's construction output is influenced by its own previous levels, current levels of fiscal and monetary factors and the previous levels of the fiscal and monetary factors. These factors include one (1) monetary policy factor; (i) commercial banks weighted interest rate. The fiscal policy factor is (i) government expenditure on construction. Inflation rate, exchange rates and total tax on products were found to be ineffective up to the 12<sup>th</sup> lag.

There are also some remarkable insights that the study has obtained regarding the research problem. The insights are as enumerated below:

1. The values of monetary policy factors in Kenya fluctuate a lot.
2. Fiscal policy factors including construction output follow an upward trend, though with little fluctuations.
3. There isn't significant influence of monetary and fiscal policy factors on construction output in Kenya in the current quarter. Major impacts of these factors are usually felt significantly in the previous quarters.
4. The stationary time series of monetary and fiscal policy factors have a very low correlation to the stationary time series of construction output in Kenya in the current quarter as compared to the previous quarter.
5. Inflation rate, exchange rate and total tax on construction do not have significant influence on construction output up to the 12<sup>th</sup> lag.

Construction output has been regressed on the independent variables to develop a scientific based mathematical model, which follows the laid down rules and hence it is objective. It is therefore able to give accurate and reliable results. The regression model developed gives an answer to the problem investigated and stated in chapter one.

### **5.3 Recommendations**

This study has found out that Kenya's construction output is not significantly influenced by monetary and fiscal policy factors in the current quarter. However, it has been seen that much of these impacts of monetary and fiscal policy factors start to be realized much later after their implementation. The dependency of the industry on funds which are borrowed as seen in Gruneberg, (1997) is the major reason for this in Kenya for the period studied. An empirical model describing the relationship between construction output in Kenya and monetary and fiscal policy factors has now been developed. This enables the industry players and stakeholders to note the effects of these factors on project finances.

In table 5.1, a summary of findings and recommendations derived from this study are given.

**Table 5.1: Findings and Recommendations**

Finding	Section	Recommendation
1. Construction output is significantly influenced by monetary and fiscal policy factors in Kenya in the previous quarters.	4.5	Construction projects which take a long construction duration are the most affected (especially more than two (2) years). It is therefore recommended that:
2. Construction output is greatly affected by monetary and fiscal factors up to as far back as 48 <sup>th</sup> lag	4.6	<ul style="list-style-type: none"> <li>i) Proper feasibility study and appraisal to be carried out on Construction projects to ensure these fiscal and monetary factors are well captured.</li> <li>ii) Sensitization/training of construction players on these factors.</li> <li>(i) Construction players involved in mega projects are advised to ensure proper feasibility study to take care of the long duration the project may take. The shorter the duration the project may take the better for the developer.</li> </ul>

## **5.4 Further Research**

It is suggested that further research be conducted where a similar study will be done with a longer time series. This is because time series analysis is time sensitive. The longer the series the more accurate are the results. Additionally, other statistical methods can be used to improve the results including an autoregressive integrated moving average (ARIMA) regression model of construction output which should be formulated. The further study should also explore non-linear relationships between construction output and its explanatory variables.

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## APPENDICES

### Appendix A: Summary of Data Collected

#### SUMMARY OF DATA COLLECTED

##### (a) Raw Data of Construction Output

OBS	CO	OBS	CO	OBS	CO	OBS	CO
2000Q1	7009.13	2003Q3	7757.81	2007Q1	8671.34	2010Q3	13296
2000Q2	8127.49	2003Q4	7570.21	2007Q2	9946.31	2010Q4	13573
2000Q3	8126.12	2004Q1	7781.46	2007Q3	11181	2011Q1	12666.2
2000Q4	7390.36	2004Q2	8518.78	2007Q4	10606.1	2011Q2	13232.1
2001Q1	7389.67	2004Q3	8944.52	2008Q1	9125.07	2011Q3	13632.2
2001Q2	8927.37	2004Q4	7686.84	2008Q2	11348.4	2011Q4	14197.1
2001Q3	8264.48	2005Q1	8282.02	2008Q3	12455.9	2012Q1	12880.3
2001Q4	7246.98	2005Q2	8506.28	2008Q4	10805.5	2012Q2	14154.1
2002Q1	7881.64	2005Q3	9599.87	2009Q1	11358.6	2012Q3	13818.6
2002Q2	8098.27	2005Q4	9012.93	2009Q2	12593	2012Q4	15473.9
2002Q3	7698.3	2006Q1	9042.07	2009Q3	12584.6	2013Q1	13836.8
2002Q4	7535.79	2006Q2	8991.58	2009Q4	12734	2013Q2	14114.9
2003Q1	7812.29	2006Q3	9745.69	2010Q1	11496.3	2013Q3	15514.3

2003Q2 8389.49 2006Q4 9869.26 2010Q2 13126.7 2013Q4 15968.3

**(b) Raw Data of Inflation Rate**

<b>OBS</b>	<b>IR</b>	<b>OBS</b>	<b>IR</b>	<b>OBS</b>	<b>IR</b>	<b>OBS</b>	<b>IR</b>
2000Q1	7.7	2003Q3	9.0	2007Q1	3.4	2010Q3	3.3
2000Q2	9.0	2003Q4	8.8	2007Q2	2.7	2010Q4	3.8
2000Q3	11.5	2004Q1	9.1	2007Q3	5.3	2011Q1	7.0
2000Q4	11.6	2004Q2	6.0	2007Q4	5.6	2011Q2	13.2
2001Q1	10.5	2004Q3	14.4	2008Q1	10.5	2011Q3	16.5
2001Q2	6.8	2004Q4	17.6	2008Q2	17.4	2011Q4	19.2
2001Q3	3.8	2005Q1	14.3	2008Q3	15.9	2012Q1	16.9
2001Q4	2.3	2005Q2	14.2	2008Q4	16.6	2012Q2	11.8
2002Q1	1.2	2005Q3	7.5	2009Q1	14.1	2012Q3	6.4
2002Q2	1.8	2005Q4	4.4	2009Q2	10.6	2012Q4	3.5
2002Q3	1.9	2006Q1	8.4	2009Q3	9.8	2013Q1	4.1
2002Q4	2.9	2006Q2	4.3	2009Q4	8.0	2013Q2	4.4
2003Q1	8.0	2006Q3	4.9	2010Q1	5.5	2013Q3	7.0
2003Q2	13.4	2006Q4	6.6	2010Q2	3.7	2013Q4	7.4

**(c) Raw data of Commercial Banks Weighted Interest Rate**

<b>OBS</b>	<b>CBWR</b>	<b>OBS</b>	<b>CBWR</b>	<b>OBS</b>	<b>CBWR</b>	<b>OBS</b>	<b>CBWR</b>
2000Q1	24.8	2003Q3	15.0	2007Q1	13.7	2010Q3	14.2
2000Q2	23.3	2003Q4	14.1	2007Q2	13.3	2010Q4	13.9
2000Q3	21.4	2004Q1	13.2	2007Q3	13.1	2011Q1	14.0
2000Q4	19.9	2004Q2	12.5	2007Q4	13.3	2011Q2	13.9
2001Q1	20.2	2004Q3	12.3	2008Q1	13.9	2011Q3	14.4
2001Q2	19.3	2004Q4	12.2	2008Q2	14.0	2011Q4	17.9
2001Q3	19.6	2005Q1	12.4	2008Q3	13.7	2012Q1	20.1
2001Q4	19.6	2005Q2	13.1	2008Q4	14.4	2012Q2	20.2
2002Q1	19.1	2005Q3	13.0	2009Q1	14.8	2012Q3	20.0
2002Q2	18.5	2005Q4	13.0	2009Q2	14.9	2012Q4	18.3
2002Q3	18.1	2006Q1	13.3	2009Q3	14.8	2013Q1	17.9
2002Q4	18.2	2006Q2	13.8	2009Q4	14.8	2013Q2	17.4
2003Q1	18.8	2006Q3	13.6	2010Q1	14.9	2013Q3	16.9
2003Q2	17.6	2006Q4	13.9	2010Q2	14.5	2013Q4	17.0

**(d) Raw Data of Exchange Rate**

<b>OBS</b>	<b>ER</b>	<b>OBS</b>	<b>ER</b>	<b>OBS</b>	<b>ER</b>	<b>OBS</b>	<b>ER</b>
------------	-----------	------------	-----------	------------	-----------	------------	-----------

2000Q1	72.8	2003Q3	76.2	2007Q1	69.6	2010Q3	80.9
2000Q2	76.0	2003Q4	76.8	2007Q2	67.4	2010Q4	80.6
2000Q3	77.0	2004Q1	76.6	2007Q3	67.0	2011Q1	82.2
2000Q4	78.9	2004Q2	78.8	2007Q4	65.2	2011Q2	86.1
2001Q1	78.2	2004Q3	80.5	2008Q1	67.9	2011Q3	93.0
2001Q2	78.2	2004Q4	80.7	2008Q2	62.6	2011Q4	93.9
2001Q3	79.0	2005Q1	76.6	2008Q3	68.6	2012Q1	84.1
2001Q4	78.9	2005Q2	76.4	2008Q4	77.6	2012Q2	84.1
2002Q1	78.3	2005Q3	75.4	2009Q1	79.6	2012Q3	84.3
2002Q2	78.4	2005Q4	73.9	2009Q2	78.4	2012Q4	85.6
2002Q3	78.7	2006Q1	72.1	2009Q3	76.2	2013Q1	86.7
2002Q4	79.5	2006Q2	72.2	2009Q4	75.1	2013Q2	84.6
2003Q1	77.0	2006Q3	73.1	2010Q1	76.5	2013Q3	87.3
2003Q2	73.7	2006Q4	71.0	2010Q2	78.9	2013Q4	85.9

**(e) Raw Data on Government Expenditure on Construction**

<b>OBS</b>	<b>GEC</b>	<b>OBS</b>	<b>GEC</b>	<b>OBS</b>	<b>GEC</b>	<b>OBS</b>	<b>GEC</b>
2000Q1	2348	2003Q3	2621	2007Q1	11279	2010Q3	16004

2000Q2	2348	2003Q4	2621	2007Q2	11279	2010Q4	16004	
2000Q3	2348	2004Q1	4074	2007Q3	11279	2011Q1	23680	
2000Q4	2348	2004Q2	4074	2007Q4	11279	2011Q2	23680	
2001Q1	2672	2004Q3	4074	2008Q1	12444	2011Q3	23680	
2001Q2	2672	2004Q4	4074	2008Q2	12444	2011Q4	23680	
2001Q3	2672	2005Q1	5073	2008Q3	12444	2012Q1	28079	
2001Q4	2672	2005Q2	5073	2008Q4	12444	2012Q2	28079	
2002Q1	2167	2005Q3	5073	2009Q1	17503	2012Q3	28079	
2002Q2	2167	2005Q4	5073	2009Q2	17503	2012Q4	28079	
2002Q3	2167	2006Q1	8112	2009Q3	17503	2013Q1	23429	
	<b>OBS</b>	<b>TTP</b>	<b>OBS</b>	<b>TTP</b>	<b>OBS</b>	<b>TTP</b>	<b>OBS</b>	<b>TTP</b>
2002Q4	2167	2006Q2	8112	2009Q4	17503	2013Q2	23429	
	2000Q1	28,441	2003Q3	29,643	2007Q1	43,263	2010Q3	54,931
2003Q1	2621	2006Q3	8112	2010Q1	16004	2013Q3	23429	
	2000Q2	26,427	2003Q4	31,522	2007Q2	44,118	2010Q4	56,911
2003Q2	2621	2006Q4	8112	2010Q2	16004	2013Q4	23429	
	2000Q3	28,467	2004Q1	31,217	2007Q3	46,774	2011Q1	50,017

(f) Raw data of  
Total Tax on  
Products

2000Q4	29,897	2004Q2	31,442	2007Q4	46,700	2011Q2	51,731
2001Q1	26,971	2004Q3	32,467	2008Q1	46,126	2011Q3	60,010
2001Q2	29,377	2004Q4	35,467	2008Q2	43,443	2011Q4	63,028
2001Q3	28,506	2005Q1	34,261	2008Q3	50,751	2012Q1	50,627
2001Q4	28,293	2005Q2	36,394	2008Q4	48,562	2012Q2	54,297
2002Q1	31,784	2005Q3	35,261	2009Q1	47,720	2012Q3	60,678
2002Q2	27,252	2005Q4	38,172	2009Q2	45,168	2012Q4	63,647
2002Q3	24,921	2006Q1	35,734	2009Q3	50,342	2013Q1	53,194
2002Q4	28,438	2006Q2	37,635	2009Q4	52,887	2013Q2	55,054
2003Q1	26,529	2006Q3	39,789	2010Q1	45,717	2013Q3	63,926
2003Q2	26,201	2006Q4	41,901	2010Q2	51,048	2013Q4	67,884

**APPENDIX B;; Data Sheet**

Observation		CBWR	CBR	ER	IR	TTP	GEC	CO
Year	Quarter	%	%	Kshs/\$	%	Kshs.	Kshs.	Kshs.
2001	:Q1							
”	: Q2							
”	: Q3							
”	: Q4							
2002	:Q1							
”	: Q2							
”	: Q3							
”	: Q4							
2003	:Q1							
”	: Q2							
”	: Q3							
”	: Q4							
2004	:Q1							
”	: Q2							

”	: Q3						
”	: Q4						
2005	:Q1						
”	: Q2						
”	: Q3						
”	: Q4						
2006	:Q1						
”	: Q2						
”	: Q3						
”	: Q4						
2007	:Q1						
”	: Q2						
”	: Q3						
”	: Q4						
2008	:Q1						
”	: Q2						
”	: Q3						
”	: Q4						

<b>2009</b>	<b>:Q1</b>						
”	<b>: Q2</b>						
”	<b>: Q3</b>						
”	<b>: Q4</b>						
<b>2010</b>	<b>:Q1</b>						
”	<b>: Q2</b>						
”	<b>: Q3</b>						
”	<b>: Q4</b>						
<b>2011</b>	<b>:Q1</b>						
”	<b>: Q2</b>						
”	<b>: Q3</b>						
”	<b>: Q4</b>						

<b>Observation</b>		<b>CBWR</b>	<b>CBR</b>	<b>ER</b>	<b>IR</b>	<b>TTP</b>	<b>GEC</b>	<b>CO</b>
		%	%	Kshs/\$	%	Kshs.	Kshs.	Kshs.
<b>2012</b>	<b>:Q1</b>							
”	<b>: Q2</b>							
”	<b>: Q3</b>							
”	<b>: Q4</b>							
<b>2013</b>	<b>:Q1</b>							
”	<b>: Q2</b>							
”	<b>: Q3</b>							
”	<b>: Q4</b>							

## **Appendix C: Introduction Letter**

Jomo Kenyatta University of Agriculture & Technology,  
P. O. Box 62000,  
Nairobi.

### **TO WHOM IT MAY CONCERN**

Dear Respondent,

#### **RE: RESEARCH**

This is to introduce myself as a postgraduate student at JKUAT undertaking a Masters degree in Construction Project Management.

It is a requirement that a student must carry out a research before graduation. In this regard, I am carrying out a research on “**Influence of Monetary and Fiscal Policies on Construction output in Kenya.**”

The attached data sheet, whose main purpose is to gather raw data from key government institutions, is presented to you as an officer in this institution for assistance.

The data being collected shall be used for academic purpose only.

Thanks for your support.

Emmanuel T. Mbusi

**Researcher**



## Appendix D: Research Permit

### RESEARCH PERMIT

**CONDITIONS**

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.

**REPUBLIC OF KENYA**

**NACOSTI**

**National Commission for Science, Technology and Innovation**

**RESEARCH CLEARANCE PERMIT**

**Serial No. A 6059**

**CONDITIONS: see back page**

**THIS IS TO CERTIFY THAT:**

**MR. EMMANUEL THYAKA MBUSI**  
**of JOMO KENYATA UNIVERSITY OF**  
**AGRICULTURE AND TECHNOLOGY, 0-100**  
**nairobi, has been permitted to conduct**  
**research in Nairobi County**

**on the topic: INFLUENCE OF MONETARY**  
**AND FISCAL POLICY ON CONSTRUCTION**  
**OUTPUT IN KENYA**

**for the period ending:**  
**31st December, 2015**

**Permit No. : NACOSTI/P/15/9403/6894**  
**Date Of Issue : 5th August, 2015**  
**Fee Received :Ksh. 1000**

**Applicant's Signature**

**Director General**  
**National Commission for Science, Technology & Innovation**

## Appendix E: Regression Output Tables

### REGRESSION OUTPUT TABLES

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#### Multiple Regression Results (Current Explanatory Variable)

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Dependent Variable: DLOG(CO)

Method: Least Squares

Sample (adjusted): 2000Q2 2013Q4

Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012671	0.013038	0.971803	0.3359
D(CBWR)	-0.013362	0.014056	-0.950605	0.3465
D(ER)	-0.007219	0.004558	-1.583793	0.1197
D(IR)	0.002176	0.003747	0.580677	0.5641
DLOG(GEC)	-0.048161	0.096185	-0.500708	0.6188
DLOG(TTP)	0.262487	0.153647	1.708373	0.0939
R-squared	0.108969	Mean dependent var		0.014971
Adjusted R-squared	0.018047	S.D. dependent var		0.088605
S.E. of regression	0.087802	Akaike info criterion		-
				1.924789
Sum squared resid	0.377753	Schwarz criterion		-
				1.705807
Log likelihood	58.93170	Hannan-Quinn criter.		-
				1.840107
F-statistic	1.198493	Durbin-Watson stat		2.320994
Prob(F-statistic)	0.323843			

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### Multiple Regression Results (Lagged Explanatory Variable)

Dependent Variable: DLOG(CO)

Method: Least Squares

Sample (adjusted): 2001Q4 2013Q4

Included observations: 49 after adjustments

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000108	0.012305	0.008750	0.9931
D(CBWR)	-0.014821	0.013666	-1.084487	0.2841
D(ER(-6))	-0.004381	0.004073	-1.075543	0.2880
D(IR(-5))	-0.002415	0.003560	-0.678414	0.5011
DLOG(GEC(-5))	0.265181	0.086963	3.049334	0.0039
R-squared	0.207491	Mean dependent var		0.013442
Adjusted R-squared	0.135445	S.D. dependent var		0.085976
S.E. of regression	0.079942	Akaike info criterion		-2.118578
Sum squared resid	0.281192	Schwarz criterion		-1.925535
Log likelihood	56.90516	Hannan-Quinn criter.		-2.045338
F-statistic	2.879967	Durbin-Watson stat		2.607538
Prob(F-statistic)	0.033384			

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