

**DETERMINANTS OF KENYAN GOVERNMENT BOND YIELDS**

**BY**

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**A DISSERTATION REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE IN THE SCHOOL  
OF BUSINESS AND PUBLIC MANAGEMENT AT KCA UNIVERSITY**

**JANUARY, 2017**

## **DECLARATION**

I declare that this research is my original work and has not been previously presented for the award of any degree in any other university.

**Signature**..... **Date**.....

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## **APPROVAL**

This research project has been submitted for examination with my approval as a university supervisor.

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## **ABSTRACT**

Government bond yield is a critical area of knowledge for both bond investors and the government. The rate of return of the government bond is crucially beneficial to the investor, since it is the rate of return on their investment. On the other hand, the government needs to be aware of the trends in its yield to be able to price any new issuance of bonds appropriately. Most developing countries are characterized with ever increasing national budget deficits coupled with rising rates inflations besides escalating interest rates. It is so true that most developing countries are issuing Treasury bonds on monthly basis and the Kenyan government is not exempted from this category. This study had sought to establish the determinants of the Kenyan government bond yields. For the purpose of this study, bond yield is the rate of interest that a bond attracts. This study had the following specific objectives; to establish the effect of a national budget deficit on yield of the Kenyan government bonds, to find out the effect of inflation on yield of the Kenyan government bonds and to assess the effect of interest rates changes on the yield of Kenyan government bonds. This study is of significance to other researchers who will use it as a basis of further research and data governing, fiscal policies makers in the government in deciding on bond pricing and the government bond investors in bond purchasing decisions. This study used secondary data available from the Central Bank of Kenya and the Kenya National Bureau of Statistics. The study adopted a time series analysis research design with regression model. The study had a target population of -Kenyan government bonds that have been in trade from year 1985 -2015. This study adopted regression analysis in order to answer the research questions. This study had sought to establish the degree of association between the determinants considered and government bond yields. Data was analysed using SPSS. Data was presented in frequency tables and inferences made. Finally, conclusions were made on the determinants of Kenyan government bond yields. The study found out that the Stationary R squared of 0.769, 0.661 and 0.653 for the ten, three and one year Kenyan government bond yield respectively. This means that the independent variables (budget deficit, inflation rates and interest rates changes) influence the yield of the ten, three and one year government bond at 76.6%, 66.1 % and 65.3 % respectively when the data is normalized at an ARIMA model. The study recommends bond investors to fully understand the market trends in order to make the right bond purchase decision and the government should benefit in pricing bonds and setting of coupon rates. The study has suggested further studies on determinants of Kenyan bonds with specific emphasis on foreign exchange fluctuations, bond denominations and bond coupon rates.

**Key Words:** Government Bond, *Government Bond Yield, Interest Rates, Government Budget Deficit, Inflation Rates.*

## **ACKNOWLEDGEMENT**

I sincerely would wish to register my sincere appreciation to my supervisor, Mr. Michael Njogo for his selfless professional guidance, wise advise and helpful suggestions without which this study would not have been completed. Equally I would also like to express my sincere gratitude to all my lecturers from the Department of Finance, who made me understand and internalize the concepts of bond yields and their determinants and consequent realization of the gap to be filled by this research. Also, I cannot fail to express my appreciation for KCA University for allowing me to undertake the course. Further, I wish to thank all my colleagues who without tiring encouraged me to keep believing, keep walking and, particularly, when the future looked pale they always motivated me to find a reason to keep winning. I am deeply humbled by your fruitful assistance. To my closest friends and relatives, I have one word for you: I will forever remain indebted for your genuine encouragements. Finally I thank the management of Central Bank of Kenya and the Kenya National Bureau Statistics for allowing data to be collected from their institutions. God bless you all!

## TABLE OF CONTENTS

DECLARATION.....	i
ABSTRACT.....	ii
ACKNOWLEDGEMENT.....	iii
TABLE OF CONTENTS .....	iv
DEDICATION.....	ix
LIST OF ACRONYMS AND ABBREVIATIONS .....	xiii
TERMS AND DEFINITIONS .....	xiv
CHAPTER ONE: .....	1
INTRODUCTION.....	1
1.1 Background of the Study .....	1
1.1.1 Government Bonds in Kenya.....	3
1.2 Statement of the Problem.....	7
1.3 General Objective .....	9
1.3.1 Specific Objectives.....	9
1.4 Research Questions.....	9

<b>1.5</b>	<b>Justification of the Study</b> .....	9
<b>1.6</b>	<b>Significance of the Study</b> .....	10
<i>1.6.1</i>	<i>Scholars and Researchers</i> .....	10
<i>1.6.2</i>	<i>The Fiscal Policy Makers</i> .....	10
<i>1.6.3</i>	<i>Government Bond Investors</i> .....	10
<b>1.7</b>	<b>Scope of the Study</b> .....	11
<b>1.8</b>	<b>Basic assumptions of the Study</b> .....	11
<b>1.10</b>	<b>De-limitations of the study</b> .....	11
<b>1.11</b>	<b>Organization of the study</b> .....	12
<b>1.12</b>	<b>Summary of the Chapter</b> .....	12
<b>CHAPTER TWO</b> .....		13
<b>LITERATURE REVIEW</b> .....		13
<b>2.1</b>	<b>Introduction</b> .....	13
<b>2.2</b>	<b>Theoretical Review</b> .....	13
<i>2.2.1</i>	<i>Efficient Market Hypothesis</i> .....	13
<i>2.2.2</i>	<i>Liquidity Preference Theory</i> .....	15
<i>2.2.3</i>	<i>Crowding Out Theory</i> .....	16

<i>2.2.4 Taylor’s Theory</i> .....	17
<i>1.1.2 Determinants of Bonds Yields</i> .....	17
<b>2.3 Empirical Review</b> .....	19
<i>2.3.1 National Budget Deficit and Yield of Kenyan Government Bonds</i> .....	20
<i>2.3.2 Effects of Inflation Rates Changes on Yield of the Kenyan Government Bonds</i> .....	22
2.3.3 Effect of Interest Rates Changes on the Yield of Kenyan Government Bonds .....	23
<b>2.4 Summary of Literature Review</b> .....	26
<b>2.5 Gaps in Literature Review</b> .....	26
<b>2.6 Conceptual Framework</b> .....	26
<b>2.7 Operationalization of the Variables</b> .....	28
<b>CHAPTER THREE</b> .....	30
<b>RESEARCH METHODOLOGY</b> .....	30
<b>3.1 Introduction</b> .....	30
<b>3.2 Research Design</b> .....	30
<b>3.3 Target Population</b> .....	30
<b>3.4 Data Collection</b> .....	31
<b>3.5 Data Analysis</b> .....	31



<b>3.6 Ethical Considerations.....</b>	<b>35</b>
<b>3.7 Data Type and Source .....</b>	<b>35</b>
<b>3.8 Summary of the Chapter.....</b>	<b>35</b>
<b>FINDINGS AND DISCUSSION.....</b>	<b>36</b>
<b>4.1. Introduction.....</b>	<b>36</b>
<b>4.2. Data Analysis and Discussion .....</b>	<b>36</b>
<b>4.2.4.1 Durbin Watson .....</b>	<b>36</b>
<b><i>4.2.1 Effect of a National Budget Deficit on Yield of the Kenyan Government Bonds. ....</i></b>	<b><i>38</i></b>
<b><i>4.2.2 Effect of Interest Rates on Yield of the Kenyan Government Bonds.....</i></b>	<b><i>40</i></b>
<b><i>4.2.3 Effect of Inflation Rates Changes on the Yield of Kenyan Government Bonds. ....</i></b>	<b><i>42</i></b>
<b><i>4.2.4 ARIMA Model of 10 year bond .....</i></b>	<b><i>43</i></b>
<b><i>4.2.6 ARIMA model for the One year bond .....</i></b>	<b><i>49</i></b>
<b><i>4.2.5 ARIMA Model for the Three Year Bond.....</i></b>	<b><i>50</i></b>
<b>4.3. Descriptive Statistics .....</b>	<b>54</b>
<b>4.3.1 Kenyan Government One Year Bond Yield .....</b>	<b>54</b>
<b>4.3.2 Kenyan Government 3 Year Bond Yield.....</b>	<b>57</b>
<b>4.3.3 Kenyan Government 10 Year Bond Yield.....</b>	<b>59</b>

<b>CHAPTER FIVE .....</b>	<b>62</b>
<b>CONCLUSION AND RECOMMENDATIONS .....</b>	<b>62</b>
<i>5.1 Introduction .....</i>	<i>62</i>
<i>5.2 Summary of Major Findings .....</i>	<i>62</i>
<i>5.2.1 Government Budget Deficit and Yield of the Kenyan Government Bonds.....</i>	<i>63</i>
<i>5.2.2 Inflation Rates and Yield of the Kenyan Government Bonds .....</i>	<i>64</i>
<i>5.2.3 Interest Rates Changes and the Yield of Kenyan Government Bonds .....</i>	<i>65</i>
<i>5.3 Conclusions .....</i>	<i>65</i>
<i>5.4 Recommendations .....</i>	<i>66</i>
<i>5.5 Suggestions for Further Research .....</i>	<i>68</i>
<i>5.6 Limitations of the Study .....</i>	<i>68</i>
<b>REFERENCES.....</b>	<b>68</b>
<i>APPENDIX .A: Letter of Introduction .....</i>	<i>72</i>
<i>APPENDIX .B: Real Interest Rates in Kenya .....</i>	<i>73</i>
<b>APPENDIX .C: Inflation Rates in Kenya for the period 1985 to 2015 .....</b>	<b>76</b>
<b>APPENDIX .D: Government Budget deficit for the period 1985 to 2015 .....</b>	<b>79</b>
<i>APPENDIX E .Kenya Government Bonds Yield from 1985 to 2015.....</i>	<i>82</i>

*APPENDIX .F: Gantt Chart* ..... 85

*APPENDIX .G: Research Budget* ..... 87

### **DEDICATION**

I sincerely thank my creator, the Almighty God who has given me immeasurable grace to pursue the desire of my life in undertaking this course. I dedicate this study, to my dear mother Jerusha Bosibori who has always, all the time motivated and encouraged me in my studies. Your encouragement and support has been instrumental in my life.

To my dear son, James Larry Morara this project is for you too. Although, little you are, I did this project for you. You always seemed to understand and appreciate my absence while undertaking my course.

Lastly this study is dedicated to all my friends who always kept on encouraging me and wishing me the very best in my studies.

## LIST OF TABLES

Table 1: 1Kenyan Government Bond Yields.....	6
Table 2: 1Operationalization of the Variables .....	29
Table 4: 1 Durbin-Watson .....	36
Table 4: 2 Multi-collinearity Test for Ten Year Bond.....	37
Table 4: 3 Collinearity Diagnostics for Ten Year Bond.....	37
Table 4: 4 Regression Coefficients for the 10 year Bond.....	38
Table 4: 5 Analysis of Anova for the Ten Year Kenyan Government Bond Yield.....	40
Table 4: 6 Regression Coefficients for Three Year Kenyan Government Bond .....	40
Table 4: 7 Regression Coefficients for the One Year Kenyan Government Bond Yield .....	42
Table 4: 8 Auto Correlation Function.....	45
Table 4: 9 Partial AutoCorrelations .....	46
Table 4: 10 Ten year Bond Model fit.....	48
Table 4: 11 Three Year Bond Model Fit.....	51

Table 4: 12 Model statistics for three year bond.....	51
Table 4: 13 Analysis of ANOVA for Three Year Kenyan Government Bond.....	52
Table 4: 14 Durbin-Watson for Three Year Bond .....	52
Table 4: 15 Model fit for the One Year Government Bond Yield.....	53
Table 4: 16 Model Statistics for one year bond .....	53
Table 4: 17 Analysis of ANOVA for one Year Kenyan Government Bond Yield .....	54
Table 4: 18 Descriptive Statistics of Kenyan Government One Year Bond.....	55
Table 4: 19 Skewness and Kurtosis .....	55
Table 4: 20 Descriptive Statistic for Kenyan Government 3 Year Bond Yield.....	57
Table 4: 21 Skewness and Kurtosis .....	57
Table 4: 22Descriptive Statistics for 10 Year Kenyan Government Bond Yield .....	59
Table 4: 23 Skewness and Kurtosis .....	59

## LIST OF FIGURES

Figure 2 1: Conceptual Framework .....	28
Figure 4: 1 Ten Year Bond Yield .....	44
Figure 4: 2 ACF AND PACF Graph.....	47
Figure 4: 3 ARIMA Model for One year Bond yield .....	49
Figure 4: 4 Three Year bond Yield Time Series Graph.....	50
Figure 4: 5Histogram for Kenyan Government One Year Bond Yield.....	56
Figure 4: 6Histogram for Kenyan Government 3 Year Bond.....	58
Figure 4: 7Histogram for 10 Year Kenyan Government Bond Yield.....	61

## **LIST OF ACRONYMS AND ABBREVIATIONS**

<b>ANOVA</b>	Analysis of Variance
<b>BEIR-</b>	Break Even Interest Rate
<b>CBK-</b>	Central Bank of Kenya
<b>CPI-</b>	Consumer Price Index
<b>EMH-</b>	Efficient Market Hypothesis
<b>GDP-</b>	Gross Domestic Product
<b>IBM-</b>	International Business Machine
<b>IMF-</b>	International Monetary Fund
<b>KCB-</b>	Kenya Commercial Bank
<b>KNBS-</b>	Kenya National Bureau of Statistics
<b>NSE-</b>	Nairobi Securities Exchange
<b>PBO-</b>	Public Bond Offer
<b>RRB-</b>	Real Return on Bond
<b>S&amp; P-</b>	Standards and Poor's

<b>SPSS-</b>	Statistical Package for Social Science
<b>OECD-</b>	Organisation for Cooperation and Development
<b>USA-</b>	United States of America
<b>YTM-</b>	Yield to Maturity

## **TERMS AND DEFINITIONS**

**Bond-** Irving (2010), defines a bond as a debt security instrument that is issued by companies or government with an aim of raising money. A coupon bond pays regular instalments and the principal on maturity date. Martel (2008), notes that bonds are facilities of providing funds to companies or government. Becker and Ivashina (2011), notes that bonds are means of raising funds for the government.

**Coupon rate-** this is the rate of interest that is attached to a specific bond (Fixler, 2010). To the issuing government, this rate of interest is the cost of borrowing while on the other hand; it is the rate of return on bond to the bond investors.

**Government bonds-** Government bonds are instruments of financing a government deficit Ndung'u (2013). Becker and Ivashina (2011) government bonds are tools of acquiring loans from individuals and institutions. Thus, government bond refers to the bonds issued by the governments in order to raise funds to finance a national budget deficit. Government bonds are interchangeably referred to as the Treasury bonds. They are usually long term debt instruments that pay interest rates at regular instalments. Treasury bonds are regarded as risk free since the likelihood of the government to default on both the coupon and principal is very low.

**Government bond yield-** Mishkin (2012), bond yield is the return on the bond. Thus, bond yield is the interest or return on investment that bond investors earn after lending money to the



government. Bond yield is the return that investors get after foregoing current consumption by lending their money to the government. Generally bond yield is inversely related to bond price.

**Government budget deficit-** Shimizu (2012), a government budget deficit is the gap when government revenue is less than budgeted expenditure. Alper and Forni(2011), notes that government budget is the public debt. This government budget deficit is the short in finance requirement by the government for a certain fiscal year. The government needs funds for various recurrent and development expenditure. Where the expenditure cannot be met by the available money, the budget is said to be in a deficit.

**Inflation rates-** according to CBK (2016) inflation is the general increase in prices in an year with a respect to a base year. Thus, it is the general increase in prices of goods and services over a given period of time. Inflation is measured by the consumer price index that aggregates a similar basket of commodities and its prices in different years, one year being the base year. Reid (2004) inflation rates is the reduction in purchasing power of money. Thus, all these definitions have a common meeting point: inflation affects the prices of commodities and is measured at a point with reference to a specific time.

**Interest rates-** According to Gruber and Kamin (2010), these are the rates of borrowing funds or returns on lending money. Ideally interest rates are expressed as a percentage of the principal amount borrowed, deposited. To the borrower, this is a cost but on the other hand to the investor is the return on investment. According to Bodie, Kane & Marcus, 2008) interest rates in a country are potential influencers to bond yields. They define interest rates are cost of funds. This research considers interest rates that are the general borrowing rates in the market.

## CHAPTER ONE:

### INTRODUCTION

#### *1.1 Background of the Study*

According to Becker and Irivishna(2011), bonds are significantly useful tools of raising funds by companies and governments from both individual and institutional investors. Bonds are an important debt security for governments and corporate institutions (Irving, 2010). Delegan and Radzewicz-Bak ( 2009 ) notes that a bond may be a debt instrument whose terms of offer, interest rates on the face value and maturity period are specified in a legally enforceable document. Principally, bonds have specific terms and maturity period upon which the regular instalments are paid whereas the principal is repaid upon the maturity of the bond. In the light of this observation, a bond is, thus a debt security that obliges the issuer to pay the holder specified number of instalments, referred to as coupon or interest and the principal is repaid at a future specified date upon maturity of the bond. It is true to suffice that; bonds are formal contracts that issuers extend to persons with an obligation of paying them interest at fixed interval periods. A bond interest rate is the percentage of face value that is paid as a cost of the borrowed funds. Interest rates are interchangeably known as coupon rates and are normally paid twice per year (Ngure 2014). The maturity period of a bond is the time period upon which the bond issuer has a legal responsibility of paying the principal to investors.

Interestingly bonds do not have a single classification. Several classes are formed basing on coupon rates, time, and the issuer. Bonds may be grouped into two categories depending on the issuer: corporate bonds and government bonds. Corporate bonds are issued by companies that seek to raise funds from the public. This happens when the companies under consideration cannot raise enough capital internally (Irving, 2010). Kibua (2001), notes that owing to the importance of the bond market in the economy, most African states have put development of corporate bond markets on their national policy agendas. On the other hand, government bonds are bonds issued by a government to supplement a deficit in the national budget. It is important

to note that, government bonds are also referred to as treasury bonds since they are usually issued by the treasury of the state. Also, government bonds are issued in the local currency. Ndung'u (2013), cites that a government running a deficit budget may cover the short in its budget by floating government bonds. Government bonds are one of the safest income generating investments to investors since the risk of default associated with them is nearly non-existence except in extreme cases of recession. Bonds remain an important means for raising capital for the government (Becker and Ivashina, 2011).

Bonds may also be categorised depending on whether they are backed by collateral security. A secured bond is that which has an associated security that the issuer gives the investor. The purpose of securing the bond is to ensure that the security can be liquidated if the bond defaults upon maturing. Irving (2010), notes that a secured bond is less risky when compared to an unsecured bond. On the other hand an unsecured bond is that which has no collateral security attached to it. Thus, unsecured bond is issued by bodies that are trusted to repay the principal and the interest as and when they fall due. According to Castillo (2004), unsecured bonds can equally be referred to as debentures since the issuing institution promises to repay the principal when obliged to do so. As matter of practice, government bonds do have security attached to them since the government is least likely to default on its payment of interest or principal.

According to Gebhardt (2005), bonds can also be classified in respect of the interest terms. Fixed interest rate bonds are bonds whose coupon rate remains same during its life span. On the contrary a floating rate bond has interest rate varying periodically during its life span. These variations in rate are typically reflections of the macro-economic changes in the economy. Pandey, I.M (2009), indicates that a floating charge may be attached to other economic factors, for instance, the rate of inflation prevailing in the market. The subscription of bonds to either fixed or floating charge depends on the risk appetite of the bond investors. This research has dealt with the yield of the government bonds in Kenya, which fall into the two categories.

This study has majored in Kenyan government bonds. Government bonds are those bonds issued by the Treasury on behalf of the central government. Becker and Ivashina (2011), notes that bonds are a crucial means of getting funds by the governments. These bonds range from short term to long term bonds depending on the purpose of the bond issuance. Kenyan government bonds are traded in the Nairobi security exchange market. Kenya being a developing country has a security exchange market that is not complex. According to Kabua (2011), the first world countries such as the United States of America (USA) have the best and most complex bond markets. The same researcher noted that the bond statistics indicates that the world bond market statistics is dominated by the developed countries. For instance America occupied large share of the pie at 39% of the world value of outstanding domestic bonds; its market is well diversified with products such as mortgage backed securities, federal agency securities, corporate and treasury bonds (BIS, 2009). Thus, the issuance of government cannot be overlooked in the modern day world. The US is far followed by Japan at 18% according to Kibua, (2011).

The Central Bank of Kenya (2016), indicates that the Kenyan government issues bonds whose maturity period range from one to thirty years. The government of Kenya issued bonds of various classes. Fixed coupon bonds bear predetermined interest rates that are paid twice per year on the face valued during the life of the bond. Also, the government does issue infrastructure bonds whose proceeds are meant for use in specific projects as specified in the bond prospectus. The zero coupon bonds have fixed interest and the holder's return is only the discount amount equivalent to the yield quoted and are mostly short term in nature(CBK,2016). It is important to state that bond investors are more inclined on the coupon rate bonds.

### ***1.1.1 Government Bonds in Kenya***

The Kenyan government has been issuing bonds to cater for its national budget deficit. By definition government bonds are debt instrument that obliges the government to be paying instalments of interests as and when they fall due and the principal is repaid when the bond matures. According to Shimizu (2012, government bonds are issued when the government planned expenditure is more than the government revenue. Thus, it is true to suffice that, government bonds are one of the mechanisms of raising funds by the states. Mbugua (2003) the

Kenyan government issued bonds that vary in characteristics and in terms of interest payments. Of importance to this study is the fact that the Kenyan government issues coupon bonds to finance its development objectives.

The Government of Kenya has occasionally issued bonds to supplement its budget. CBK (2016), indicates that the treasury bonds are issued on a monthly basis. Thus, the contribution of bonds in raising the national budget monies cannot be overlooked. Kenya also issues Euro bonds. A Euro bond is a bond denominated in foreign currency and besides raising finance, it is geared towards attracting Foreign Direct Investments in the country (Machel, 2013). In Kenya government bonds are short or long term fixed interest securities issued by government to corporate or individual investors. Treasury Bonds are also traded in both primary and secondary markets. In Kenya the primary market is through auctions and the secondary market is through NSE. An investor needs at least Kshs. 50,000 to purchase bonds in Kenya although the central government is aiming to release cheaper bonds (Ministry of Finance 2015). The CBK(2016), documents that the government of Kenya issues fixed coupon bonds, zero coupon, floating rate, infrastructure, restructuring bonds, amortized and savings development bonds.

The Kenyan government has issued treasury bonds within the country and outside the country. The first Euro bond was issued in 2015. The KenGen Bond was an infrastructure bond that aimed at raising capital for investments in geothermal power. The government issued both bonds through Public Bond Offer (PBO). According to Ngure (2014), in the year 2014 the Kenyan government had a sum of 63 individual bonds trading in the NSE. These bonds have an estimated value of Ksh 400 billion with a maturity of one to twenty years. Additionally, all these bonds are fixed coupon bonds that either carry a fixed or floating coupon rate and being either secured or unsecured. The issuance of the Euro bond made Kenya the first state in East and central Africa to float such a bond internationally.

Bond yield is the bond return as given by the summation of the bond price and the capital gain. Bonds are traded in the secondary market like any other security. Bond yield in Kenya depends on a number of factors owing to the economic status of the country. To invest in treasury bonds in Kenya, one needs a minimum of Ksh 50,000 and may increase in multiples of the same amount.

However, the government is in the process of floating lower priced bonds. In Kenya government bonds are traded in the NSE. Sale of bonds at a profit at the market creates capital gains.

According to Mbugua (2003), corporate bonds unlike government bonds had high yields since the interest were taxable. Thus, government bonds may have lower yields even when placed under same interest circumstances with corporate bonds. It is also crucial to note that government bonds are issued by the government to raise funds to finance the various government projects. In Kenya and other developing states the fiscal policies by themselves are not capable of raising the required money to fund current and development expenditure of the state. The treasury issue bonds to institutional investors and individual investors. The Kenyan bond market liquidity is a factor that determines the bond yields. By definition, liquidity of the Treasury bond market is the ease by which traders are able to enter or leave the market. Bonds that are actively trading in the NSE tend to attract more investors and hence may have high yields unlike the bonds that trade in the primary market only. However, owing to the nature of developing market, government bonds in Kenya are also influenced by the feeling of investors on transparency of the issuing process. Bond yield thus, may be influenced by the state of the nation in terms of political good will and governance.

Bonds tend to yield better if the political, macroeconomic and regulatory factors are favourable (Ringui 2012). Although it is debatable politics of the state influences much of the monetary and fiscal policies. For instance, when Kenya was engulfed in a political strife in 2007, the security market recorded fluctuations in price of stocks (Mbugua 2013). Bonds are regarded as volatile securities. The volatility of the bond is the rate of change in its trading prices. Infrastructure bonds issued by the government of Kenya to finance specific projects tend to be less volatile since they are long timed bonds. In the circumstance that the prices in the market are expected to vary significantly in the short run, it follows that the bond yields are high, *ceteris paribus*. According to Clark (1973), security and asset volatility is caused by the possession of new information by investors dealing in the securities under consideration. To this end, where information that is likely to affect the bond reaches the market, how it is perceived by the market

determines the bond prices. It is crucial to note that higher bond prices within a short period of time increases the bond yield.

The CBK (2016), defines bond yield as the annualized percentage increase in the value of a bond. The yield depends on several factors such as the volatility of the market and the remaining time to maturity of the bond. Government bond yield is important to both the government and the bond investors. The yield curve, which depicts the relationship between the interest rates and the time to maturity, helps the investors in deciding on the trading opportunities. To the government it may act as a guide to pricing future treasury bonds. For instance, the government twenty year bonds on November 2015 had a yield of 13.05%. To the investor this is the rate of return on their investments in government bonds. According to Nyaga (2015), notes that long years to maturity of Treasury bonds affect investments decisions by investors. The researcher noted that interest rate is the major revenue centre for Treasury bonds, thus, the higher the interest, the higher the return. It is for this reason that investors will prefer high interest generating long bonds even if their maturity period is long.

*Table 1: 1Kenyan Government Bond Yields*

<b>Year</b>	<b>Kenyan Government Bond Yields for From the Year 2009-2015, %</b>		
	<b>10 Year Bonds</b>	<b>3 Year Bonds</b>	<b>1 Year Bonds</b>
<b>2009</b>	11.89	11.95	12.06
<b>2010</b>	8.82	10.60	10.10
<b>2011</b>	17.07	17.32	17.31
<b>2012</b>	17.02	17.08	17.08
<b>2013</b>	13.48	13.40	13.49
<b>2014</b>	12.53	12.57	12.45
<b>2015</b>	15.51	15.59	15.57

**Source (CBK, 2016)**

This study considered the Kenyan government bond yields with a maturity of 10 years, 3 years and 1 year. The yield of the government bond was considered from the year 1985 to 2015. The complete set of government is indicated in Appendix E. Evidently, the ten years bond increased in yield from 2009 reaching the highest at 17.07 % in 2011, then dropping to 12.53 % in 2014(CBK,2016). All bonds have showed a similar trend in yield. It is peculiar that the 3 year bond is which that has reached a high of 17.32 % in the period of study (CBK, 2016). Conventionally, the longer the period to maturity the high the bond yield. However, this is the definite truth for the Kenyan government bond. Thus, this study seeks to find out the determinants of the government bond yields.

There is generally an inverse relationship between the price of the bond and its yield. Assuming an investor purchases a Kenyan government bond with a par value (face value) of Kshs. 500 and an annual coupon rate of 10 percent, the yield will be the coupon rate divided by the par value. Thus, the yield will be 2%. In the circumstance than the bond price falls to Kshs. 400, the new yield will be 2.5 %. However, the bond holder enjoys the same amount of interest owing to the fact that the coupon rate is based on the face value. Thus, conclusively the yield of the bond rises when the bond price falls.

## **1.2 Statement of the Problem**

Government bonds are issued by the government with an aim of raising funds to finance a deficit in government budget. Gichovu (2012), notes that the growth of the bond market in Kenya is an indication of the increasing importance of bonds in raising funds for both the government and corporates. Various previous researches have established different findings on the determinants of government yields. Fen *et al* (2014) carried out a research on the determinants of government bonds in Malaysia in which they found that inflation had insignificant effect on the yield of government bonds. On the other hand Gruber and Kamin (2012) notes that inflation has a positive impact on the government bond yield. Thus this research was justified in order to compare and contrast its findings with those of other studies done outside Kenya.



Poghosyan (2012), working for IMF carried a research on the “Long-Run and Short-Run Determinants of Sovereign Bond Yields in Advanced Economies”. The research focused on examining the effect of debt to GDP ratio for long run and inflation rates besides short term interest rates as the determinants of sovereign bond yields. The study found out that in the short-run, sovereign bond yields deviate from the level determined by the same determinants in the by the long-run. Although, this study established that most deviations were stabilised in less time, the study is based in Europe and North America whose macro-economic conditions are undeniably different from the third world. On the contrary Jiang & McCauley, (2004) indicates that inflation has no significant relationship to government bond yield. It is for this reason, that a clear research gap existed, thus the justification for this study in Kenya to establish the determinants of government bonds.

Nyaga (2014), did a research on the determinants of Treasury Bonds uptake in Kenya. The research found out the determinants of treasury bonds uptake were liquidity; credit rating; rate of interest; floating rate bonds; gearing ratio; infrastructure bonds; zero coupon bonds; years to maturity and fixed coupon bond. Although, this study is crucial to matters pertaining government bonds and returns, this study was delimited to uptake hence did not consider the government bond yields. In spite of the importance of the government bonds in financing the government budget deficit, the bond market is less developed than the equity market (Ngugi and Agoti, 2007). To this end, it is valuable to carry out research on the determinants of government yield and perhaps in the process establish this phenomenon.

The yield on bonds may be increased when a company increases the portion of debt in its capital structure (Barclays & Smith, 2005). Where this is the circumstance, investors interpreted that the entity has a faith in increased future cash flows. This may be true for the private entities. However, it has not been substantiated that increased in government budget deficit increase the government bond yields. Investors on government bonds rely on signalling effects of information in the bond markets.

In Kenya a few researches have been undertaken on bonds but with a bias on corporate bonds (Ringui, 2012; Ngure, 2014 and Gichovi, 2011). Evidently therefore, only a limited researches has been specifically been carried out on bonds and those done dealt with corporate bonds. Thus this research aimed at filling this gap in two folds; it has considered the determinants of government bonds and also aimed at ascertaining the contradicting findings on the determinants of government bond yields.

### **1.3 General Objective**

The general objective of the study was to establish the determinants of Kenyan government bonds yield.

#### ***1.3.1 Specific Objectives***

- i. To establish the effect of a national budget deficit on yield of the Kenyan government bonds.
- ii. To determine the effect of rates on changes in inflation rates on yield of the Kenyan government bonds.
- iii. To establish the effect of interest rates changes on the yield of Kenyan government bonds.

### **1.4 Research Questions**

- i. What is the effect of a deficit national budget on the yield of Kenyan government bonds?
- ii. What is the effect of changes in inflation rates on the yield of Kenyan government bonds?
- iii. To what extent do interest rate changes affect the yield of Kenyan government bonds?

### **1.5 Justification of the Study**

Government bonds yield is important to both government and the investor. The study on determinants of government bond yield is, thus justified. This study critically analysed data and assessed the cause and effect of the variables being sought. This study is a credit to the

knowledge bank. By undertaking this research, government bond yield has been assessed on a cause and effect relationship; this is the essence of this study.

## **1.6 Significance of the Study**

The researcher believes that this study may be of help to the following people;

### ***1.6.1 Scholars and Researchers***

This study is a credit to the knowledge bank. This study has discussed issues on and about government bonds, bond yields and macro-economic factors affecting bond yields in Kenya. These critical discussions will be used by future researchers and scholars who will be looking on information about these subjects. Also, this study may be used a basis for further research. Students carrying out researches on this field will benefit in a great way by getting secondary data that will be documented in this study.

### ***1.6.2 The Fiscal Policy Makers***

Treasury bonds are a vital source of public finance. This research will revolve around how bond yields are affecting by the various fiscal factors. To this end, the policy makers will use the findings of this research to formulate appropriate policies on government policies. The researcher will examine the role of CPI and inflation, interest rates fluctuations and deficit budget and their effect on bond yields. Thus, the policy makers will get information on how to react to the determinants in order to streamline the regulation of the Kenyan bond market.

### ***1.6.3 Government Bond Investors***

This research will help investors to get critical analyses of bond yields. Through this research, investors will be educated on how to decide on bond purchase and sale in the face of the various determinants. This study will be of great importance to traders of government bonds. Bond markets are volatile and it is important for investors to make informed decisions about bond trading. Information is crucial in all decision making situations and investors will use the findings of this study to make the best and most appropriate buy or sell decisions.

### **1.7 Scope of the Study**

The study will investigate the determinants of Kenyan government bonds yields. The study will be considering the Treasury bonds currently in the market and historical data from year 1985 to 2015 will be used. The study will use secondary data available from the Central bank of Kenya on 10 year, 3 year and 1 year bond. The study considers these bonds because they are the most issued by the Treasury (CBK, 2016).

### **1.8 Basic assumptions of the Study**

This research assumed that the secondary data that was used for data analysis was correct, up to date and represent the general trend on Kenyan government bonds, government bond yield and determinants of bond yield in the Kenyan context. More so, the research assumed that it was possible to alienate the specific determinants of government bond yields that were considered in this study from other factors.

### **1.9 Limitation of the Study**

This study has been limited to the possibility that the sample size of Kenyan government bonds selected may not be a representative of the population of the Kenyan government bonds. The Kenyan government bonds are issued on monthly basis and are of various types, vary in coupon rates and denominations. To mitigate this challenge the sample was specific to 10 year bond, 3 year bond and 1 year Kenyan government bond that traded from 1985 to 2015. Data was collected over 31 years and thus, this fostered the validity of generalizing the findings. The study was a cross sectional analysis since it considered data for more than one period and took into account Kenyan government bonds with different maturity periods.

### **1.10 De-limitations of the study**

For an academic research delimitation has been defined as the process of reducing the study population and area to a manageable size. Delimitations define the scope and

boundaries of a certain study (Leeds, 2010). This research is delimited in terms of the scope of the problem, population, sample size and the objectives. Participation of this study is delimited to Treasury bonds issued by the Kenyan government. This study was also delimited to local government bonds and to this end, the research wishes to caution that Euro bond, bonds other than ten, three and one year, have not be considered in this research.

### **1.11 Organization of the study**

This research study is organized in five chapters. Chapter one contains the background to the research study, presents the statement of problem, objectives and research questions. Also, the chapter has the significance, justifications, limitations and delimitations of the study. Chapter two comprises of the literature review on the different aspects subtle to the determinants of government yields. The chapter is globally organized into theoretical background and empirical reviews of the specific objectives. Chapter three outlines the methodology adopted by the study in collecting and analysing data while encompassing the data collection instruments, the target population and the sample size. Chapter four describes the data analysis techniques, the findings and interpretations respective to the study's objectives. Chapter five harbours the research study's conclusions, discussions, recommendations and ultimately suggestions for further reading and research are given.

### **1.12 Summary of the Chapter**

This chapter has introduced the study on determinants on Kenyan government bond yields. Bond yield has been defined as the return on a specific bond and the researcher also described the various types of bonds. Bond yield is crucial to both institutional and individual investors in Kenya. Such factors like inflation, changing interest rates, government budget deficit and their relationship with bond yield have been discussed too. At this juncture, it is so true to suffice that these factors do not determine the yield of the government bond singly, but it is the confluence of all of them that will practically determine the bond yields.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviews theoretical and empirical literature which is related to the study based on the following thematic areas: the theories of the study, empirical review, national budget deficit and bond yields, Consumer Price Index and inflation and bond yields, changes in interest rates and bond yields. Also the chapter has a proposed conceptual framework and a summary of gaps in literature review and a summary of the chapter.

#### **2.2 Theoretical Review**

This section discusses specific theories that are subtle to the concepts of government bond yield and the determinants of bond yields. According to Wacker (1997), a good research is based on a theory. A theory helps in giving research conceptual definitions, terms limitations and ensures predictability of the relationship between the variables under the study. This instant study was navigated by the following theories; efficient market hypothesis, liquidity preference theory, crowding out theory and Taylor's theory.

##### ***2.2.1 Efficient Market Hypothesis***

Efficient Market Hypothesis is an information theory. This theory was put forward by Professor Eugene F. Fama, a 2013 Nobel Laureate, who was a Finance professor at Chicago University in the United States. According to Fama (1970), financial markets are characterized as being "informationally efficient". In the view of this theory, a proposition is made that no investor can over time achieve returns in excess of average market returns. Ideally this theory postulates that given time, information become available to investors and hence the returns are normalized. This theory has three major subsets: weak, semi strong and strong form efficiencies. The weak EMH asserts that the prices on the traded financial assets say stocks and bonds already reflect all past

publicly available information. This is to imply that information is known and within the access of all investors. For this very reason, thus, there are no abnormal or excess investment returns that can be acquired. On the other hand, semi strong EMH identifies that the prices of asset reflect all publicly available new information. Also, this is available and with the access of all investors. Thus, no excess gain can be achieved by trading on this information. Except for the idea of new available information that is a unique feature of semi-strong EMH, both weak and semi strong are alike. On the contrary, strong EMH idealizes that prices asset prices reflect both public and privately available information and evidently therefore, no investor can gain excess return as well. At this juncture, perhaps it is true to note that asset prices are regulated by the availability of information in the market. That, there is evidence for and against the weak and semi-strong EMHs, while there is powerful evidence against strong EMH is an observation by (Fama, 2009).

This theory is subtle to this study. The bond market is a complex one, that exhibit information asymmetry. Bond investors may have similar information at their disposal or some may be at an advantage. Thus, this theory provides a good impetus to the understanding of the bond market. To the extent of government and corporate bonds, past studies carried in Kenya has supported the existence of the weak market hypothesis. For this reason, government bond yield tend to reflect an efficient market in which the prices are influenced by competition among the great deal of players. This theory thus, seems to conclude that at any single point in time, the price of an asset security will be a reflection of the information in the market. Juan (2006), notes that any point in time the actual price of a security will be a good estimate of its intrinsic value while according to Dunne, Moore & Pontes (2006), changes in the market structures are as a result of the regulators. This theory is important in this study, since it gives insights on how information availability may affect government bond yields in Kenya. Kenyan government bonds are publicly traded in the NSE that is open to all investors. The prices of the bonds are dictated by the judgments of the investors. It is for this very reason that the bond yields changes over a period of time. The market dynamics in the bond market is basically brought into existence by how information flows within the market. Where there is reliable information on bond prices and

expected rate of interest there is a chance that bond yields will follow a certain path. Hence, the theory of Efficient Market hypothesis is relevant to this study.

### ***2.2.2 Liquidity Preference Theory***

The theory of Liquidity of Preference was coined by an English Economist, John Maynard Keynes in the 1930s. According to Keynes, investors prefer assets that are more liquid in nature. In this instance, liquidity means the ease of converting assets into equivalent cash money. The investors are actually willing and prepared to pay a premium for the more liquid assets and it so true that they will to seek pay less for the less liquid assets. In this regard, the long term government bond pays higher interest rates since they are less liquid as compared to the short term bonds. This theory may be interpreted to fit this research in a way that, long term government bonds are not easy to exchange in both primary and secondary markets. Thus, in the light of this theory, a government bond investor will be more eager to purchase the short term bonds which practically have less volatility than the long term bonds.

According to Winfred and Cury (2010), the volatility of bonds tends to be greater in the circumstance where the coupon rate is lower and the maturity period longer. More importantly, this theory injects the concept of “liquidity premium rate” which is the additional rate that investors demand in order to hold the long term securities that are more often linked to a lower intensity of volatility. The reason why investor may require short term bonds is due to the uncertainty of events (Reily & Brown, 2000). Short term securities are convertible to cash with ease if a need for cash arises. However, this does not entirely imply that the long term bonds are not convertible, but rather, they may be converted with a possible loss of value due to their unpredictability nature. A critical analysis of Keynesian model with respect to this study does hint that increase in government deficits will increasingly highly likely increase the interest rate. Perhaps, this is because increase in interest rates, increases the cost of borrowing money. The government hence must pay more to use borrowed funds through the issuance of bond. It should be noted that to the government the coupon rate is a cost and to the investor it is a return on investment. Thus, a rise in interest rates increases the demand for loanable funds and this will have a tendency of decreasing the bond price. Changes in the interest rates will hence affect the



bond yield. There is an inherent reversed movement in bond price and bond yield. In other words increase in bond price decreases the bond yield and vice versa.

In the light of the observations presented by the theory of liquidity preference, it follows that this theory holds for this study. Principally, bonds pay interest rates at rates that are attached to the face value of the bonds. Investors have a tendency of liking the most liquid bonds. Thus, ceteris paribus, a bond investor will have a high appetite for a short term bond. This is because the bond will be easy to liquidate in the secondary market. It is true to suffice that; long term bonds may be harder to trade in the market. They are usually regarded as hard to sell, hence the bond buyers asks for a premium over and above the market rates. This discussion points that liquidity is a factor in deciding on bond purchase and to this end, thus, is an aid to this study. It helps explain why government bond investors prefer bonds of certain time to maturity to others.

### ***2.2.3 Crowding Out Theory***

This theory nominally means the displacement of private economic activity by public economic activity. According to Carlson and Spencer (1975), Crowding out effect government spending displaces near equal amount of private spending. Thus, when the government borrows to finance a budget deficit it keeps off private spending. It should be noted that, government bonds are so enticing that when they are issued most investors crash for them due to their risk free nature. Therefore, crowding out effects tends to assert that the government eats up all loanable funds due to offering lucrative interest rates. This thus, leaves the private borrowers with nowhere to borrow from. The reason why, investors prefer government as the borrower is because the government bonds are less risky and pays higher coupon rates. In Kenya, this theory seems to hold water. The Treasury bond market tends to be more active than the corporate bond market (Ngugi and Agoti, 2004). It has been noted that investors also are aware that the government is capable of printing to pay off its debts as a last resort. In the context of this research, this theory provides highlights on why investors have a preference for certain securities to others.

This theory is crucial to the study on determinants of bond yields in Kenya. Bond yield refers to the rate of return on the bonds. It has been conceptualized that when the bond prices goes up, the bond yield goes down. Where the government borrows largely from the public, it will scare away

the private borrowers. The government has an ability to pay interest instalments as and when they fall due since it rarely defaults on its payments. Thus, evidently, the effect of crowding out may influence the bond yields. This study has one of its specific objectives being to find out the effect of government budget deficit on bond yields. This is because when the government has an increasing budget deficit, it will borrow more from the public.

#### ***2.2.4 Taylor's Theory***

John B. Taylor developed this theory in the year 1911. According to Taylor, the central bank of a country has a mandate to set monetary policies that are appropriate to change the interest rates especially where there are changes in either inflation or output, for instance. Simply put, if there is a one-percent increase in inflation the central bank should increase the interest rate by more than one percent. This will ensure that the decrease in purchasing power of money as a result of inflation is compensated by the increase in interest rates. For the purpose of this study, it should be noted that the government bonds pays interest to the investors. Where the government bond is a fixed coupon bond, an increase in inflation technically means a lower yield to the investor. It is for this reason that most government bond investor would wish to purchase the floating charge bond. Thus, Taylor rule is much of a theory of predicting bond yield with respect to short term interest rate.

#### ***1.1.2 Determinants of Bonds Yields***

Madhavan, A., and Porter, D., (2001) defines bond yields as the rate of return of a government bonds measured over a period of time. It is true to suffice that, investors buy the government bond with the goal of creating wealth. Ideally a government bond is regarded as risk-free in that it is not prone to default risk. The chance of the government failing to service the interest and principal as and when they fall due is minimal. Over time, bond yields are different and this may be attributed to various macro-economic factors. Ngugi *et al* (2007), notes that the growth of Treasury bond market is a prerequisite for development of corporate bonds markets. Perhaps this poses the question as to what subtle factors that determine bond yields. The Kenyan government bonds are issued to finance the national budget deficit. The use of someone else's money calls for a price and this price is the coupon paid by the government to bond investors. (Mishkin &

Eakins, 2012) idealises that the government can never fail to service its bonds obligation since it can print more money and increase taxes to avert any implications from inflation.

Among the factors that determine government bonds is the Public debt. Most governments in the world run deficit national budgets and for this reason, it becomes necessary for them to issue Treasury bonds. Kenya's public debt stood at Ksh. 709.7 billion at the end of June 2004. Out of the outstanding public debt, Ksh. 306.2 billion or 43.2% was domestic. The share of domestic debt in GDP stood at 26.4% in June 2004 (Ngugi 2011). A larger public debt means that the government spends more money in servicing the bonds. L. Giordano, N. Linciano, P. Soccorso (2012) found that the yield of government bonds across Europe was positively related to the increase in public debt with Ireland recording the lowest yield during the period of the study. Hence, it can be deduced that increase in government budget deficit subsequent lower yield of the bonds. Perhaps, this is because, in the circumstance that a government majorly runs of debt, the trust towards its bond is lower unlike when the budget is surplus or balanced. However, it is virtually not feasible for a country to have a balanced budget in realism. The government hence should take precautionary measures in matters of fiscal policies. According to Giordano *et al* (2012), a rise in government deficit budget casts a doubt in if the government will be capable of paying the periodic interests. Thus, when the public debt is excessively high it highly likely shows that the default risk is high too. It is for this reason that, investors will seek a higher coupon rate when the country is highly geared.

Consumer Price Index also affects the yield of the government bonds. According to the Kenya National Bureau of Statistics (2016), Consumer Price Index is defined as a measure of the weighted aggregate change in retail prices paid by consumers for a given basket of goods and services. Thus, CPI aims at reinstating the money buying power at certain past dates in the economy. CPI is a good measure of inflation rates in the country since it aggregates a given basket of goods and services at different economic times. KNBS (2016), denotes that in calculation of CPI, commodity price changes are measured by re-pricing the same basket of goods and services at regular intervals, and comparing aggregate costs with the costs of the same basket in a selected base period. The percentage change of the CPI over a one-year period is

what is usually referred to as inflation. Primarily bond yields are affected by the rates of inflation as measured by the CPI. Where the purchasing power of the local currency decreases over time, bond interests go up nominally. However, this increase in interest rates from the bonds does not necessarily imply a better bond yield. Investors are just asking for a proportional increase in rates as a compensation for the loss of purchasing power of money.

Interest changes in the economy may also affect the yield of government bonds. Interest is the charge (cost) of using borrowed funds. According to the European Commission (2012), Italy had high stock debt and thus required lots of primary surpluses to offset interest payments. As government budget and public debt grow, the default risk for government bond rises too and this prompts investors to demand a risk premium as a cushion. Thus, increasing the interest rates in the economy what appears as a kind of paradox of thrift. It is for this very reason that the government should precautionary use fiscal and monetary to raise finance to fund its public expenditure. Favero and Missale (2012) find evidence that the long-run fluctuations in yield spreads of Euro countries are related to fundamentals of economy growth, inflation rates, public debt and interest rates but that such relations are not constant over time. Bond yields in times of high interest rates goes up, other factors kept constant and assuming ideal situation.

At this juncture, the study noted that the determinants of government bond yields do not function singly. Rather, it is the confluence of all the factors that will influence the yields of bonds. This research had sought to identify the effect of national budget deficit, inflation rates and interest rates changes on the Kenyan government bonds yield.

### **2.3 Empirical Review**

Empirical review is a critical analysis of literature extracted from past studies and researches that are related to a topic. This study shall consider studies from the international scene and locally too. The section is organized as per the objectives of the study.

### ***2.3.1 National Budget Deficit and Yield of Kenyan Government Bonds***

A government budget deficit implies a situation where the money collected or planned to be by the government, will not be enough to cater for all of public spending. On the other hand a national budget surplus means public funds are more than public expenditure. Obviously, a surplus budget would be better but it is not a usual occurrence for third world countries. A balanced budget is where public expenditure equals public funds from fiscal income and others. Various researches have shown that there is a positive relationship between government budget deficit and government bond yields. Huntley, J. (2014), argues that in the long run, rising government deficit leads to increase in interest rates in the economy. This is because most people are motivated to save and lend to the government and hence increasing the market interest rates. When the government depends on borrowing by issuing treasury bonds, it follows that the interest rates in the market may rise. This is because the private sector and the government will be competing for a share of the loanable funds from individual investors and institutions. Thus, from the discussions it can be seen that an increasing budget deficit increases interest rates and hence the bond yields.

Hysing Yu (2015), carried a research on the “Determinants of the Government Bond Yields in Spain: A Loanable Funds Model”. The study had the objective of carrying out a regression analysis do establish the equilibrium government bond yield, the demand for and supply of loanable funds. The study established that bond yield in Spain is positively related with government debt. The study was a cross sectional studies from 1999 to 2014. Also, the study found out that the government debt crisis in Spain is expected to raise bond yields. The research notes that the government debt crisis of 2000 lead to Spanish government bonds to increase by 0.6709 percent. In this research, it can be noted that increase in government debt to GDP ratio increase the yield of the government bonds. This is because; the price of the bond goes down since the government seeks to raise more money to finance the deficit. Thus, the bonds are less priced but carry a high coupon rate. Therefore, the cost of lending the government money in a deficit budget becomes expensive. Although, this research aids in explaining the relationship between the increase in government debts and bond yields in Spain, the study does so in a crisis faced state. The

findings may not be applicable in the Kenyan context and for this reason, this current research sought to determine the effect of government debt on the yield of Kenyan government bonds.

According to Gruber and Kamin (2012), a rapid expansion in government debt may require an increase in interest rates if investors are to accept a larger share in their investment portfolios. Also, an increase in government budget deficit increases the chance of the government to default in servicing the bonds instalment payments and settlement in the principal as and when they fall due. Thus, investors will seek a premium hence increasing the bond yields. They carried a research titled “Fiscal Positions and Government Bond yields in OECD”. This was an international discussion paper. Very subtle to this study is the fact they observed that larger government deficits puts pressure on national resources. Thus, the government seeks to raise money by issuing bonds to the public. Thus, this may lead to crowding out effect in the country. The study established that long term bond yield in G7 countries tend to trend down in any increase of government debt. However, the research established that Japan government bonds showed reverse results. Thus, this research is not wholly conclusive as to the effect of fiscal deficits on government bond yields. To this end, this current research sought to establish the effect of government budget deficit on government bond yields.

A study on New Evidence on the interest rate effects of budget deficits and debt was carried by Laubach T. (2007). This research had the aim of isolating all other fiscal and monetary policy and thereby establishes the probable effect on budget deficit on government bond yields in the United States. Specifically in the papers term, the paper sought to studies the relationship between long horizon forward rates and future federal government deficits and debt as projected by the Congressional Budget Office. The paper considered a 30 year sample and established that there was an increase in bond yields for every projected deficit/GDP ratio. This study explains that an increase in government budget deficit will more likely than not increase interest rates in the economy. It is for this reason that the bond yields rise since the government are the debt security for the government. This instant study will seek to establish the determinants of the

government bonds yields in Kenya. Secondary data was used to analyze bond yields over time to establish, if there was any relationship between government budget deficit and bond yields.

Nyaga (2015), conducted a study on the “Determinants of Treasury Bond uptake in Kenya”. The study had an overall objective of establishing how liquidity, credit ratings, rate of interests and years to maturity affected bond uptakes in the Kenyan bond market. The study argues that Treasury bond is a critical component of Central Banks’s monetary policies. The study design was descriptive. The target population was Treasury bonds that were issued between 2001 and 2014. For data analysis the study adopted multiple regression and inferential statistics. The study established that the determinants of Treasury bond subscriptions by investor’s were; liquidity, credit ratings, rate of interest, floating rate bonds and infrastructure bonds. This study is important since it gives highlights on the determinants of bond uptake in the Kenyan context. Finally, the research recommended that further studies be done on the effect of inflation on Treasury bond investments. Thus, this research heeds to this call and sought to establish the determinants of the Kenyan government bond yields.

As per the discussion, it can be deduced that a rise in government deficit will more likely increase interest on bonds. Baldaci and Kumar (2010) notes that a higher public debt leads to increased long term interests. Increase in budget deficit, increases bond yields since casts a doubt in ability of the government to repay the debt (Jaramillo and Weber, 2013). Poghosyan (2013), argues that a higher debt may rise sovereign bond yield due to the risk premium.

### ***2.3.2 Effects of Inflation Rates Changes on Yield of the Kenyan Government Bonds***

Inflation is the general increase in prices in a given period of time. The rates of inflation may have effects on the bond yields. According to Ngugi (2011), factors affecting bond supply are importance of investment opportunities such as developmental projects, expected inflation and government fiscal activities. Shimizu, Y. and Ichue, H. (2012), did a paper on “determinants of long term yields: a panel data analysis of major countries and decomposition of yields of Japan and the US”. The paper has the general objective of establishing the determinants of long term bond yields. The study established that inflation expectations significantly influence long term yields. Also, the paper found out that an increase in government debt financed internally had an

influence on the long term government bond yields. They argue that inflation rates is two folds: one, there is the actual rate of inflation and the uncertainty rate that bond investors will to be compensated in order to hold government bonds for longer periods.

Reid C., Frederic D. and Ian. C.,(2004), did conducted a study on the “Real Return Bonds(RRB), Inflation Expectations, and the Break-Even Inflation Rate”. They were investigating on the Fisher equation that indicates that the spread between the nominal interest rates in a country and the real interest rates in the same country is capable of predicting the inflation expectations. The study regarded the interest rates offered by the government of Canada as a depiction of real interest rates. On the other hand they idealizes that the nominal interest rates were represented by the corporate bonds, that in usual cases paid the investor the realized rate of inflation at the time of sale. The study further had the objectives of establishing the Break Even Interest Rate (BEIR) of the Canadian government 30 year bonds. The study did find that there is an inflation risk premium that investors seek before they purchase government bonds in an inflationary economy.

Some studies have it that there is a difference between short term and long term bonds. Karanja 2014), argues that investors are rational and sceptical about postponing current consumption in order to invest in long term securities. A study conducted by Krishnamurthi (2002) on the “yield difference between on-the-run and off-the run 30 year bond yields” established that the yield difference results from a demand for liquid assets. This is to mean that investors preferred short term securities as contrasted to long term securities. The liquidity premium for long term government bonds is more than that of short term government bonds.

In conclusion, it may be inferred that, bond yield is positively related to inflation. There is positive relationship between bond yield and inflation rates (Acker and Duck 2013). The most significant factor in bond yield is inflation (Campell and Vuoteenaho, 2004). This current research sought to establish the effect of changing inflation rates on Kenyan government bonds.

### 2.3.3 Effect of Interest Rates Changes on the Yield of Kenyan Government Bonds

Interest rate is the charge of using someone’s money. Interest rates do change with time due to a variety of factors. In the case of government bonds, interest rate is the cost of the debt paid to the bond investor. According to Fen *et al* (2012), short term interest rate is the cost of using a



debt such as Treasury bond that has a maturity of less than one year. On the other hand long term interest rate is the cost of the debt instrument that has a maturity of more than one year. It is important to note that it is usually complex to predict interest rates movements within the market particularly in the long run. Ideally interest rates changes present both opportunities and risk to the bond investors. For this reason it is crucial for the bond investor to critically consider interest rates changes in order to make prudent economic decisions. In the simplest economic terms, interest rate risk is the risk that the bond price will be affected by changes in interest rates. The bond price and bond yield have an inverse relationship in the usual case. Put differently, when the price of a bond falls the yield of the same bond rises. Thus, when interest rates increases, the bond price decreases, however, when interest rate goes up, the bond yield goes down. It is generally observed that long term government bonds have greater interest rates. This may be attributed to the uncertainty of the future economic trends.

A study on the relationship between short term interest rates, inflation, and GDP growth and government bond yields was done by Gruber and Kamin (2012). This study concentrated on the OECD countries. The study established that these macro-economic variables had positive and significant relationship with government bond yields. In general terms an overall increase in market interest rates would make a new bond less appetizing because the already existing bond would be paying better interest returns. Poghosyan (2013) also noted that interest rates will affect government bond yields. At any point in the discussion presented in this study, it should always be remembered that the interest rate is the cost of the debt and the government would wish to pay as little as it can. Conversely, interest rate is the rate of return and the bond investor would always seek to receive more. Interest charges are the main cost of debt financing and their fluctuations should be investigated with respect to government bond yields.

When interest rates are falling, say for instance a bond is issued today, will practically be paying less interest than a similar bond issued on an earlier date when interest rates were higher. In other words, the already existing bonds become so enticing that investors will be willing to pay a premium to acquire them since they are paying higher returns. Although, this is the usual phenomenon, it is not a principle. Connected to interest rates is the Yield to Maturity (YTM). YTM is the unchanging interest rate that will make the present value of the future cash inflows

of the bond equal to its price. Phoghosyan (2012), postulates that debts instruments are rated according to their risks by such international rating bureaus as Standards & Poor's and Moody's ratings. For instance the S& P, Dow Jones(2016), debt ratings are as: A A A , A A (Very high quality) A , B B B (High quality) B B , B (Speculative) C C C , D (Very poor) . The government is regarded as credit worthy and hence may be charged a lower interest by the market. At this juncture it is important to note that all these factors do not act in isolation. It is the confluence of all of them that determines the government bond yields.

In conclusion, interest rates have a potential of affecting government bond yields As noted by Baklaci (2003), short term interest rates, inflation rates are the main significant factors influencing government bond yields. Poghosyan (2013), also noted that interest rates have a potential effect on bond yields. While Ngure (2014), argues that bond uptake in Kenya are influenced by volatility. Fen et al (2012), concurs that there is a positive relationship between interest rates and government bond yields.

The rates of interest in Kenya are escalating. Commercial banks in Kenya are charging high rates of interest on loans to borrowers. Equally bond investors are likely to call for higher rates of return. Where other interest earning ventures such as fixed deposits are paying more interests than the government bonds, it would imply that bond interest would go up. It is important to distinguish between long term interest rates and short term interest rates. According to Irving (2010), short term interest rates are those interest rates that accompany short term debt securities. Thus, the interest rates on Treasury bills with maturity periods of less than a calendar year are referred to as short term interest rates. On the other hand, long term interest rates are specific to bonds with more than a year to maturity. Both long term and short interest may influence the yield of the government bonds in Kenya. This is because; where the interest rates are high the government will apply monetary and regulatory policies to the financial markets to curb any effect to the inflation rates in the economy. There is a positive and largely significance relationship between bond yields and the prevailing interest rates (Gruber and Kamin,2012)

## **2.4 Summary of Literature Review**

This chapter has discussed the various subtle variables of the study that include government budget deficit, inflation rates and interests. This chapter has discussed the theories underpinning the course of the study. These theories help in enhancing the predictions of government bond yields given the various determinants under the scope of this study. Also, empirical studies from an international outlook and local perspective have been discussed in great depths. To justify the undertaking of this research, the study has identified the gaps in literature review. Thus, this study is justified and sought to establish the determinant of the Kenyan government bond yields.

## **2.5 Gaps in Literature Review**

Although various studies have been undertaken to establish the determinants of government bonds in the world, a few have been specific to Kenya and Africa at large. Nyaga (2012) studied on the determinants of Treasury bond uptakes. Ngure (2014) studied on the effect of bond issues on share prices while on the international scene, while Poghosyan (2012), studied on the long run and short run determinants of sovereign bond yields in advanced economies. Fen et al (2012), studied on the determinants of Malaysian government bond yields. Evidently, therefore there is a need of studying the Kenyan government bond yields and this study sought to establish the determinants of Kenyan government bonds yield.

## **2.6 Conceptual Framework**

The independent variables are; government budget deficit, inflation rates and interest rate changes. On the other hand the dependent variable is ; Kenyan government bond yield. In other words, the independent variables are the determinants of Kenyan government bond yields that are within the scope of this study. Government budget deficit makes the government borrow from various sources and if it decides to borrow internally, it usually floats treasury bonds. A rise in the government budget deficit casts a doubt that the government may default in servicing the bond coupons and principal on maturity. However, practically the government is less likely to default in its obligation and it is for this reason that the government treasury bonds are regarded as risk free debt instruments.

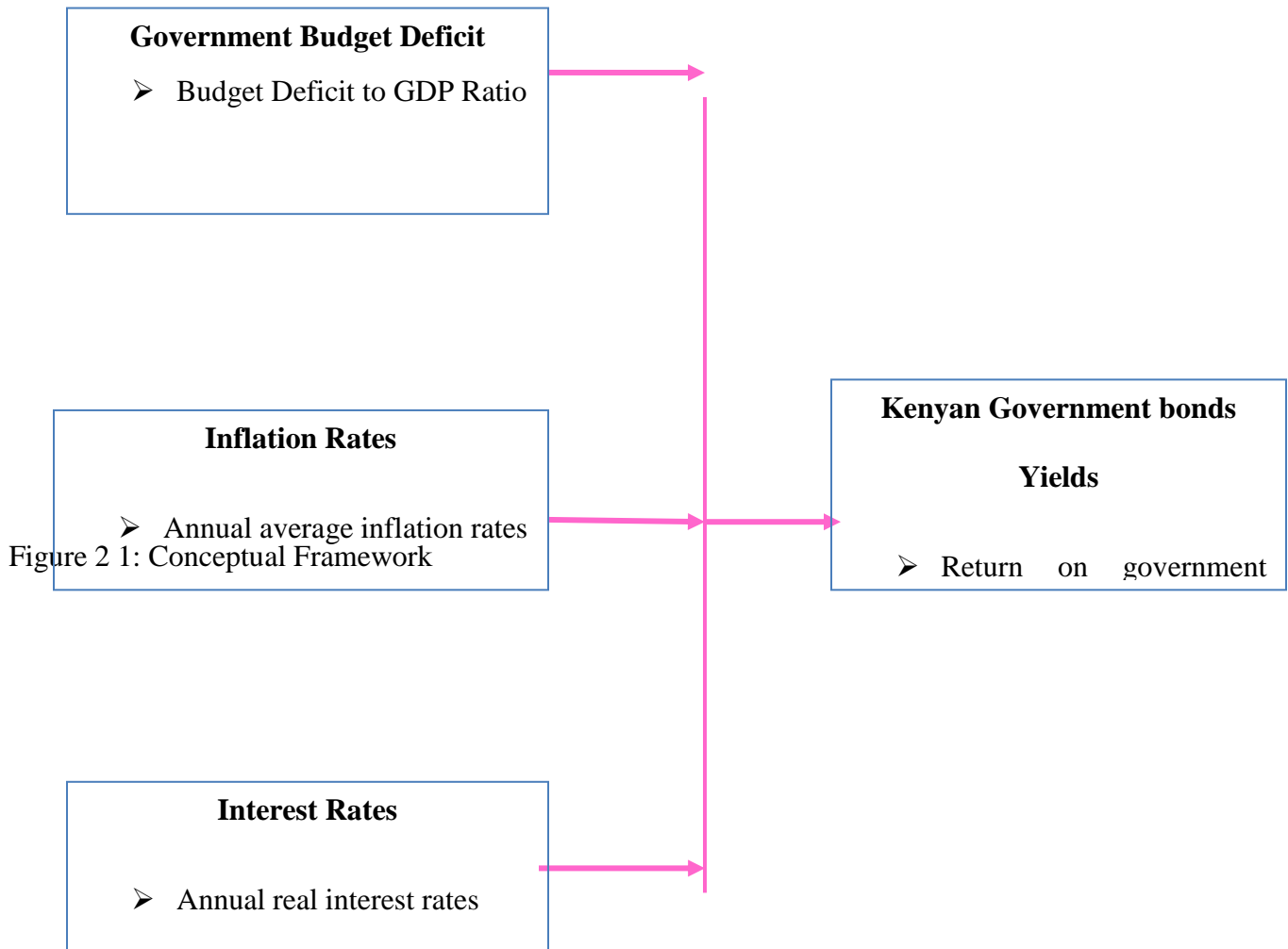
Notwithstanding that fact, it has been observed that government bond yield take different rates depending on whether they are long term or short term. This study sought to establish the probable relationship, if any, between an increase in government debt to GDP ratio on the government bond yield in Kenya.

Inflation is the general increase in prices of commodities over a period of time. Inflation is measured by the CPI that picks a given basket of commodities and seeks the changes in price using a certain base year. Inflation increases the prices of goods and services in the economy. Put differently, inflation reduces the purchasing power of the money. Thus, in an inflationary economy, government bond investor will seek for a premium in bond interest to compensate them against the “loss of purchasing” due to inflation. Government interest rates are two folds. First the rate of interest (coupon) is the cost incurred by the government for using money belong to others and two, it is the return on investment to investors. Short term interest increases the yield of the bond since they seem predictable unlike the long term interest rates. Where interest rates change in escalating magnitudes, bond yields become volatile. Thus, bond prices go down and consequently increases the bond yields. It should be noted that, although in absolute definition, generally there is an inverse relationship between bond price and bond yield.

The Kenyan government bond yield refers to the rate of return on the bond. The investors would wish to make money in receiving regular interest payment, twice annually or as per the terms in the bond prospectus. In Kenya, the CBK is responsible for floating treasury bonds for the government. In the eyes of the bond investor a bond that pays higher interests in appetising and friendly to commit monies into it. However, the government yields are neither constant nor easily predictable. There are underlying determinants of the bond yields. This study having realized that a few researches have been in Kenya on bond yields will seek to establish the determinants of the Kenyan government yields. This study will be guided by the conceptual framework as under Figure2.1

**INDEPENDENT VARIABLES**

**DEPENDENT VARIABLE**



## 2.7 Operationalization of the Variables

In seeking to achieve the objectives, the study collected secondary data from the Central In In In seeking to achieve the objectives, the study collected secondary data from the Central Bank of Kenya. The study had sought to answer the research questions on how government budget deficit, inflation rate and interest rates affect the yields of the Kenyan government bonds. The study had sought to establish the relationship between the independent variables and dependent variables. The operationalization of the variables is per Table 2.1.

Table 2: Operationalization of the Variables

<b>Objective</b>	<b>Independent variables</b>	<b>Indicators</b>	<b>Scale</b>	<b>Tools of Analysis</b>	<b>Types of Analysis</b>
<b>To establish the effect of a national budget deficit on yield of the Kenyan government bonds</b>	National budget deficit	➤ Government budget deficit to GDP ratio	Nominal and ordinal	Frequency distribution tables and percentages	Descriptive Regression
<b>To find out the effect of inflation on yield of the Kenyan government bonds</b>	Rates of inflation	➤ Annual average inflation rates	Nominal and ordinal	Frequency distribution tables and percentages	Descriptive Regression
<b>To assess the effect of interest rates changes on the yield of Kenyan government bonds.</b>	Interest rates changes	➤ Annual real interest rates	Nominal and ordinal	Frequency distribution tables and percentages	Descriptive Regression

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter contains the research methodology that was used to conduct this study on the determinants of the Kenyan government bonds yields. Research methodology is critical since it depicts how practical can data be collected and its validity and reliability to meet the objectives and test the hypotheses of the study. To this end, this study has the following thematic areas; research design, target population, data collection procedure and data analysis techniques.

#### **3.2 Research Design**

This study adopted a time series analysis with the dependent variable being Kenyan bond yield as determined by government budget deficit, inflation and interest rates. A research design may be defined as the arrangements of conditions in order to facilitate achievement of objectives which are specific to a particular study. Kothari (2004) noted that a research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the purpose with economy in procedure.

#### **3.3 Target Population**

A population is a complete set of individuals with the same common observable characteristics Mugenda and Mugenda (2003). Target population is the portion of the total population which the study draws its respondent components. The target population for this study was all 10 year, 3 year and 1 year treasury bonds that have been in the market from years 1985-2015. Kenya is a third world country whose government budget in most cases is deficit. The tax system is not good enough it terms of adherence to the cannons of taxation and hence less income tax is realised by the state. Thus, the government floats treasury bonds to fund the deficit. The study considered the aforementioned bonds because they are the most active, most traded bonds in both the primary and secondary market in Kenya.

### 3.4 Data Collection

This study made use of secondary data that is available from the Central Bank of Kenya, Kenya National Bureau of Statistics and the National Treasury. Thus, data was collected through desktop analysis with a bias to the 10 year, 3 year and 1 year bond that is trading from 1985 to 2015. The study considered the specific bonds because they are the commonly issued in the market (CBK, 2016). According to Cooper and Schindler (2006) secondary data mining is a quality tool of data collection for the confidential information that is available in government departments.

### 3.5 Data Analysis

Data was analysed using the Auto Regressive Integrated Model (ARIMA). The study data was collected for a period of 31 years. For this reason, data was analysed through time series with an aim of establishing the forecast of the influence of the independent variables (government budget deficit, inflation rates and interest rates) on the Kenyan government bond yield. Data was analysed using time series multiple regression analysis with the aid of Statistical Package for Social Sciences (SPSS). The auto regression (AR<sub>p</sub>) model will thus have the following model

$$Y_t = \theta_1 Y_{t-1} + \theta_2 Y_{t-2} + \theta_3 Y_{t-3} \dots + \theta_p Y_{t-p} + \varepsilon_t \quad (\text{Eqn 3.1})$$

Where  $Y_t$  = the Kenyan government bond yield at time year  $t$ .

$Y_{t-1}, Y_{t-2}, Y_{t-3} \dots Y_{t-p}$  is the yield in previous year

$\theta_1, \theta_2, \theta_3 \dots \theta_p$  are the coefficients to be estimated by the model

$\varepsilon_t$  = inherent error in percentage yield of government bond yield in an year.

At this point it is important to note that the AR model assumes the value of the Kenyan government bond yield at time  $t$  is related to the value of yield at  $t-1$ . The model takes into account  $p$  lags which are the yield at the last year in the series.



The Moving Average (MAq) will have the following model:

$$Y_t = \mu + \theta_1 \varepsilon_t + \theta_2 \varepsilon_{t-1} + \theta_3 \varepsilon_{t-2} + \dots + \theta_q \varepsilon_{t-p} \quad (\text{Eqn 3.3})$$

$Y_t$  = yield of the Kenyan government bond yield.

$\mu$ =Constant mean of Kenyan government bond yield

$\varepsilon_t, \varepsilon_{t-1}, \varepsilon_{t-2}, \varepsilon_{t-3}, \dots, \varepsilon_{t-p}$  = are the error of government yield in the years under consideration

$\theta_1, \theta_2, \theta_3, \dots, \theta_q$  = Coefficients to be estimated by the model

The model tends to accounts for a possibility that the value of the Kenyan government bond yield is influenced by the residuals from the previous years.

When the AR(p) and MA(q) were combined, then ARMA model was developed as follows:

$$Y_t = \theta_1 Y_{t-1} + \theta_2 Y_{t-2} + \theta_3 Y_{t-3} + \dots + \theta_p Y_{t-p} + \theta_1 \varepsilon_t + \theta_2 \varepsilon_{t-1} + \theta_3 \varepsilon_{t-2} + \dots + \theta_q \varepsilon_{t-p} \quad (\text{Eqn3.3})$$

With this ARMA model, the study developed the a sample of Autocorrelation function (ACF) and partial autocorrelation function (PACF). To this end, the ACF  $p(k)$  at lag  $k$  of the  $Y_t$  series is the linear correlation coefficient between  $Y_t$  and  $Y_{t-k}$  calculated for  $k= 0, 1, 2, 3, \dots$  by

$$P(k) = \frac{\text{cov}(Y_t, Y_{t-k})}{\sqrt{(\text{var}(Y_t) \text{var}(Y_{t-k}))}} \quad (\text{Eqn 3.4})$$

Equally, it is important to note that the PACF was determined by the equation at  $Y_t$  and  $Y_{t-k}$ . One rule of PACF is that it is commuted after removing the values  $Y_1, Y_2$  and  $Y_3$  and  $Y_{t-p}$ . in the model. These two aspects are crucial in that they help define to what extent the current Kenyan

government bond yield is related to past yields of the same bonds. In other words they help us identify how many past values(lags) we should consider for forecasting and thus explaining the trend of the Kenyan government bonds yields.

In summary the model is as under table 3.1

*Table 3: 1 ACF and PACF Summary*

<b>Model</b>	<b>ACF</b>	<b>PACF</b>
<b>MA(p)</b>	Spikes decay towards zero	Spikes cutoff to zero
<b>MV(q)</b>	Spikes cutoff to zero	Spikes decay towards zero
<b>ARMA(p q)</b>	Spikes decay towards zero	Spikes decay towards zero

It is equally important to test the times series model for stationarity. At a stationery process, the mean and the variance do not change over time and the process does not have trend. This is based on the regression fact that at a stationery point the gradient of the curve is zero.

In general the ( $\Delta$ ) will be given by the following equation.

$$BY = Y_{t-1} \tag{Eqn. 3.5}$$

Where;

BY is the lag.

$Y_{t-1}$  is the bond yield at t-1

On the same note, detrending may be done in order to obtain more stable graphical representations that is very useful in obtaining the residuals,

Thus, the ARIMA model which is denoted as ARIMA (p, d, q) where p is the order of the auto regressive section of the model, q is the order of the moving average and d indicates the extent of differencing. Where d= 0 the ARIMA model is disintegrated into ARMA because at a stationary point the change ( $\Delta$ ) will be zero.

$$\Delta Y_t = (1- B) Y_t \tag{Eqn. 3.6}$$

Where B is the backward line operator (the lag)

$Y_t$  is the government bond yield at time  $t$ .

For the purpose of time series analysis, when the ACF of the series values as depicted by the graph either cuts off quickly or dies down fairly quickly, then the analysis is regarded by and large to be stationary. Differencing is the process of making the trend stationary. In the vent that stationary is obtained, then;

ARIMA model will be

$$\Theta_p B (1-B) Y_t = \mu + \Theta_q \varepsilon_t$$

The variables have been defined in the respective AR (p) and MA(q) equations.

The time series models must be tested for adequacy. This is facilitated by the Ljung-Box Q statistics.

Having discussed the time series analysis, this study had the following time series model;

$$Y_t = \Theta_1 Y_{t-1} + \Theta_2 Y_{t-2} + \Theta_3 Y_{t-3} + \dots + \Theta_p Y_{t-p} + \Theta_1 \varepsilon_{t-1} + \Theta_2 \varepsilon_{t-2} + \Theta_3 \varepsilon_{t-3} + \dots + \Theta_q \varepsilon_{t-p}$$

(Eqn3.7)

For the regression analysis, the model was established as under

$$KGBY_t = \beta_0 + \beta_1 KGBD_t + \beta_2 INFR_t + \beta_3 INTR_t + \varepsilon_t \quad (\text{Eqn3.8})$$

Where;

$KGBY_t$  = Kenyan government bond yield at time  $t$

$\beta_0$  = is the constant to be estimated by the model

$\beta_1, \beta_2$  and  $\beta_3$  = Coefficient indicating influence of independent variables on the dependent variable.

$KGBD_t$  = Kenyan government budget deficit at time  $t$

$INFR_t$  = inflation rates as indicated by Consumer Price Index at time  $t$

$INTR_t$  = interest rates at time  $t$

$\varepsilon_t$  = inherent error in the model normally distributed about a mean of 0 and for this research analysis, the  $\varepsilon$  will be assumed to be 0.

### **3.6 Ethical Considerations**

The study had sought to collect data that may be sensitive and confidential from public records. The study targeted bond issued by the government of Kenya. In as much as the government acts on behalf of the citizens, the researcher treated the information with all due confidence as the case made it necessary. The researcher further states that data was collected under the umbrella of Central Bank of Kenya and even if provided by staff of the bank, they were not expressly mentioned in any part of the research. Thus the researcher respected the ethical consideration of informed consent and confidentiality.

### **3.7 Data Type and Source**

This study made use of secondary data collected from the period 1985 to 2015. The main sources of data for this study were from the Kenyan government department of Treasury, the central bank of Kenya and publication of the World Bank. The study data thus is allowable for analysis due to the authenticity of the sources. The Central bank of Kenya is mandated by the government to issue Government bonds in Kenya. Additional information was obtained from Kenya Bureau of Statistics. Having noted this, the study data is of a high reliability and was deemed fit for analysis in order to meet the specific objectives.

### **3.8 Summary of the Chapter**

This chapter has presented the research design. The study has used time series research designs. Time series analysis is particularly useful since secondary data was used for analysis and was collected for a long period of time. The analysis hence was used to draw the cause and effect between the independent variables and government bond yield. Also, the chapter has presented the target population as the Kenyan government bond trading from 1985 to 2015.

## **CHAPTER FOUR**

## FINDINGS AND DISCUSSION

### 4.1. Introduction

This chapter focuses on data analysis, presentation and interpretation of the findings. The main purpose of this study was to find out the determinants of Kenyan government bond yields. After field work, data was prepared by editing, coding and cleaning. The data was analysed using SPSS. The study had the following specific objectives: To establish the effect of a national budget deficit on yield of the Kenyan government bonds, to find out the effect of rates on changes in inflation rates on yield of the Kenyan government bonds and to assess the effect of interest rates changes on the yield of Kenyan government bonds.

### 4.2. Data Analysis and Discussion

The study analysed data using time series analysis and regression analysis due to the nature of the data collected.

#### 4.2.4.1 Durbin Watson

There was a need for establishing the DW value. The finding is indicated under Table 4.4

Table 4: 1 Durbin-Watson

Durbin-Watson <sup>b</sup>					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.112 <sup>a</sup>	.165	-.097	2.11190	1.540

a. Predictors: (Constant), Interest\_Rates, Budget\_Deficit, Inflation\_Rates

b. Dependent Variable: Bond\_Yield

The study used DW test to check autocorrelation among the variables being investigated. The DW test value was 1.540 which is between 1 and 3. This implied that the data had no autocorrelation.

Table 4: 2 Multi-collinearity Test for Ten Year Bond

		Coefficients <sup>a</sup>						
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	11.926	1.451		8.221	.000		
	Budget_Deficit	-.081	.138	-.120	-.585	.563	.871	1.148
	Inflation_Rates	.003	.047	.014	.064	.949	.794	1.259
	Interest_Rates	.019	.088	.048	.211	.835	.716	1.397

a. Dependent Variable: Bond\_Yield

Multi-collinearity develops when one or more of the independent variables is highly correlated to one or more of the independent variables. This study used the Variance Inflation Factor (VIF) to test multi-collinearity. The result was the VIF for budget deficit was 1.148 and tolerance of 0.871; inflation rates has a VIF of 1.259 and a tolerance value of 0.794 and interest rates had a VIF of 1.397 and a tolerance value of 0.716. Since the VIF of all factors is less than 10 and tolerance is values are more than 0.1, this rules out the chance of multi-collinearity problem among the independent variable. This implies that Budget deficit inflation rates and interest rates can be used in the same model with no effect of multicollinearity.

Table 4: 3 Collinearity Diagnostics for Ten Year Bond

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Budget_Deficit	Inflation_Rates	Interest_Rates
1	1	3.040	1.000	.01	.03	.02	.01
	2	.512	2.437	.00	.61	.00	.08
	3	.402	2.748	.00	.08	.47	.10
	4	.045	8.177	.99	.28	.51	.80

a. Dependent Variable: Bond\_Yield

#### 4.2.1 Effect of a National Budget Deficit on Yield of the Kenyan Government Bonds.

The study had sought to assess the effect of national budget deficit on yield of Kenyan government bonds. For the purpose of the study, the ten year bond has been presented under this objective for ease of drawing the findings. However, the data output of three year, one year bond has been factored in the analysis.

Table 4: 4 Regression Coefficients for the 10 year Bond

		Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	11.926	1.451		8.221	.000		
	Budget_Deficit	-.081	.138	-.120	-.585	.563	.871	1.148
	Inflation_Rates	.003	.047	.014	.064	.949	.794	1.259
	Interest_Rates	.019	.088	.048	.211	.835	.716	1.397

a. Dependent Variable: Bond\_Yield

The study had sought to establish the determinant of the Kenyan government bonds. The regression equation is thus explained as per the SPSS in this form;

$KGBY_t = \beta_0 + \beta_1 KGBD_t + \beta_2 INFR_t + \beta_3 INTR_t + \varepsilon_t$ , where the values can be obtained from the table will become

$$KGBY_t = 11.92 - 0.81 KGBD + 0.003 INFR + 0.19 INTR + \varepsilon_t$$

The regression holds that holding budget deficit, inflation rates and interest constant the 10 year Kenyan government bond yield will be 11.92 %.  $\beta_1$  has a value minus 0.081 meaning that an increase in budget deficit of 1 % lowers the 10 year bond yield by 8.1 %. The values of  $\beta_2$  is 0.003 implying that a 1 % increase in inflation rates will increase the 10 year bond yield by 0.3 % and  $\beta_3$  has a value of 0.019 implying that a 1 % increase in interest rates will increase the 10 year bond yield by 1.9 %. The most significant factor for the yield of the ten year bond has thus been established to be budget deficit which is 0.81. It is important to note that the yield of the bond is the interest rates paying on that particular bond. The ten year bond is a long term bond and it may be difficult to tell on the changes in long term interest rates. It is for this reason that the interest rate changes make the bond more volatile. Reid et al (2004), the real return of bonds may be used as indicators of inflation rate in the economy. This is to imply that the yield of bonds may be a factor of inflation rates in the macro economic conditions.

It can be deduced that bond yield is significantly influenced by government budget deficit. According to Yu Hsing (2012) the increase in government budget deficit increases the real interest of treasury bonds. To this end thus, this study contradicts with the findings since the data indicates that there is a negative relationship between Kenyan government bond yield and changes on the government bond yield.

This findings concurs with research concurs with those of Narayanan (2007), who noted that the increase in government budget deficit does not increase the yield of the bonds. This is because, where the bond market is low and is not super active, thus, the yield will not respond to any issuance of small government bonds. Also Gujarati and Porter (2009), the effects of government budget deficit may not necessarily affect the yield of the government bonds.

Further, Yen *at al* (2014) established that the Malaysian government bond yield was by a large extent not explained by the variations of government budget deficit and or public debt. Thus, it



can be observed that the effect of government budget deficit has varying reactions. More importantly, the government bond has other factors that operate within the market. For instance there is liquidity and bond denomination that may largely affect the bond yields in developing countries.

The Kenyan bond market is relatively under developed and thus the confluence of factors influencing the bond yield may not be critically analysable. To this end, this research may not offer guaranteed results although data has been observed on time series analysis. To the least, it is of paramount to notice that that it is the confluence of the determinants of bond yield that influences yields and not one by one factor.

*Table 4: 5 Analysis of Anova for the Ten Year Kenyan Government Bond Yield*

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.537	3	.512	.115	.951 <sup>b</sup>
	Residual	120.424	27	4.460		
	Total	121.961	30			

a. Dependent Variable: Bond\_Yield

b. Predictors: (Constant), Interest\_Rates, Budget\_Deficit, Inflation\_Rates

The F statistics of this bond is 0.115 and the P-value is 0.951 which is greater than 0.05 implying that the independent variables affects the government bond yield significantly at a significance level of 0.05.

#### ***4.2.2 Effect of Interest Rates on Yield of the Kenyan Government Bonds.***

*Table 4: 6 Regression Coefficients for Three Year Kenyan Government Bond*

#### **Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	13.019	1.481		8.792	.000	9.981	16.058
	Budget_Deficit	-.058	.141	-.082	-.411	.684	-.347	.231
	Inflation_Rates	.004	.037	.139	.669	.509	.129	1.126
	Interest_Rates	.013	.090	.241	1.099	.281	.282	1.085

a. Dependent Variable: Bond\_Yield

The regression equation is thus explained as per the SPSS in this form;

$KGBY_t = \beta_0 + \beta_1 KGBD_t + \beta_2 INFR_t + \beta_3 INTR_t + \varepsilon_t$ , where the values can be obtained from the table will become

$$KGBY_t = 13.019 - 0.058 KGBD + 0.004 INFR + 0.013 INTR + \varepsilon_t$$

The regression holds that holding budget deficit, inflation rates and interest constant will be minus 13.019. The most significant factor for the yield of the three year bond has thus been established to be Kenyan Government Budget Deficit.  $\beta_1$  has a value of -.058 which means that a 1 % increase in government budget deficit will lower the bond yield by 0.058 percent a,  $\beta_2$  has a value of 0.004 that means a 1 % percent increase in inflation rates will increase the 3 year bond yield by 0.004 percent and likewise  $\beta_3$  has value of 0.013 that implies that 1 % increase in interest rates will increase the 3 year bond yield by 0.013 percent.

The research thus has found there is a positive relationship between the Kenyan government bond and government bond yield. The finding of this study concurs with those of Baklati (2003), who noted that interest rates affect the bond yield with a positive way. Interest rates affect the

rate of return on government bond because changes in real interest rates are significant in the bond markets. According to Poghosyan (2013) interest rates affects government bond yield on a positive and at a significant level.

Conversely, it is crucial to note that the rate of interest a bond pays is the yield of the bond. Bond yield by principle is negatively related by the bond price. This study considered effects of long term interest rates. Long term interest rates are the rates of return on government bond yield that matures for more than an year. (Mishkin & Eakins, 2012) argues that the rates of interest rates are better measured by reference to the rates of return on bond yield. It is important to note that the government cannot default on its obligations.

#### 4.2.3 Effect of Inflation Rates Changes on the Yield of Kenyan Government Bonds.

Table 4: 7 Regression Coefficients for the One Year Kenyan Government Bond Yield

		Coefficients <sup>a</sup>						Collinearity Statistics	
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Tolerance	VIF	
Model	B	Std. Error	Beta						
1	(Constant)	10.992	1.382		7.955	.000			
	Budget_Deficit	-.188	.131	-.283	-1.427	.165	.871	1.148	
	Inflation_Rates	.002	.044	.007	.036	.972	.794	1.259	
	Interest_Rates	.024	.084	.063	.289	.775	.716	1.397	

a. Dependent Variable: Bond\_Yield

The study had sought to establish the determinant of the Kenyan government bonds. The regression equation is thus explained as per the SPSS in this form;

$KGBY_t = \beta_0 + \beta_1 KGBD_t + \beta_2 INFR_t + \beta_3 INTR_t + \varepsilon_t$ , where the values can be obtained from the table will become

$KGBY_t = 10.992 - 0.188 KGBD + 0.002 INFR + 0.24 INTR + \varepsilon_t$ . The regression holds that holding budget deficit, inflation rates and interest constant will be 10.99 %. The most significant factor for the yield of the ten year bond has thus been established to be Kenyan Government Budget Deficit. Giordano (2012), identified that the sovereign debt crisis was a significant determinants of sovereign bond spreads.  $\beta_1$  has value of -0.188 implying that a 1% percent increase in budget deficit will lower the bond yield by 0.188 percent,  $\beta_2$  has a value of 0.002 implying that a 1% increase in inflation rate will increase bond yield by 0.002 percent and finally  $\beta_3$  has a value of 0.24 which implies that a 1 % increase in interest rates will increase the bond yield by 0.024 percent.

This study has established that inflation rates affect the government bond yield on a low significant level. It is notable that usually when the expected rate of inflation increase one percentage should commensurate to a one increase in nominal interest rates.

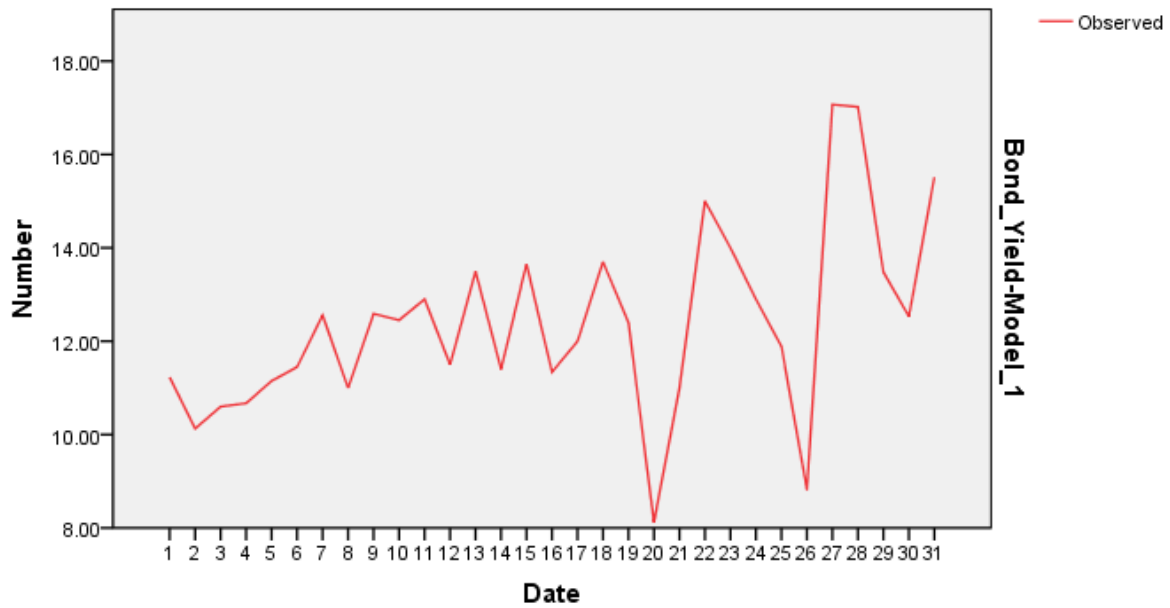
Yu(2015), on the research determinants of the government bond yield in Spain: a loanable funds model identified that there is a positive and significant relationship between government bond yield and government budget/GDP ratio, rates of interest for the treasury bills and the expectation inflation rates. Gruber and Kamin (2010), found out that there was a significant influence on long term bond yields by changing fiscal conditions in the economy.

#### ***4.2.4 ARIMA Model of 10 year bond***

The study was concerned with identification of the determinants of the Kenyan government bond yield. In all the three bonds considered, the ARIMA model was taken to have 16 lags and the Autocorrelation and Partial Auto correlation functions had the 16 lags.

```
>ACF<-acf( datats,lag.max.16)
```

```
>PACF<-acf( datats,lag.max.16)
```



*Figure 4: 1 Ten Year Bond Yield*

The time series analysis involves three steps; model identification, estimation and verification. As depicted by graph in figure 4.1 the data the Kenyan government bond yield oscillations vary in magnitude at different points in time in the years under consideration. The graph indicates that the Kenyan government ten year bond yield is not changing regularly as depicted by the sharp spikes.

Table 4.8 indicates the autocorrelations of the ten year bond.

Table 4: 8 Auto Correlation Function

**Autocorrelations**

Series: Bond\_Yield

Lag	Autocorrelation	Std. Error <sup>a</sup>	Box-Ljung Statistic		
			Value	df	Sig. <sup>b</sup>
1	-.273	.174	2.472	1	.116
2	-.328	.171	6.151	2	.046
3	-.085	.168	6.406	3	.093
4	.191	.165	7.757	4	.101
5	-.040	.161	7.818	5	.167
6	.360	.158	12.989	6	.043
7	-.378	.155	18.944	7	.008
8	-.099	.151	19.374	8	.013
9	.167	.148	20.642	9	.014
10	.141	.144	21.600	10	.017
11	-.269	.141	25.250	11	.008
12	.189	.137	27.154	12	.007
13	-.121	.133	27.982	13	.009
14	.086	.129	28.426	14	.012
15	-.069	.125	28.730	15	.017
16	.025	.121	28.774	16	.026

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

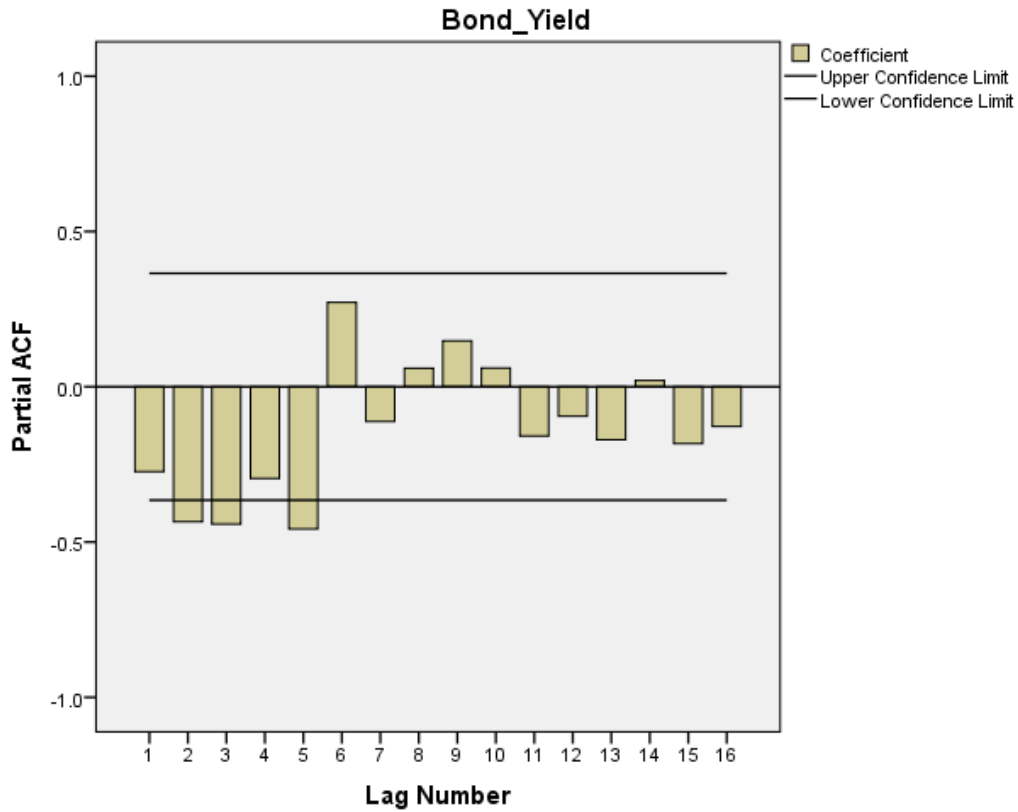
*Table 4: 9 Partial AutoCorrelations*

**Partial Autocorrelations**

Series: Bond\_Yield

Lag	Partial Autocorrelation	Std. Error
1	-.273	.183
2	-.435	.183
3	-.442	.183
4	-.295	.183
5	-.458	.183
6	.272	.183
7	-.112	.183
8	.060	.183
9	.148	.183
10	.060	.183
11	-.159	.183
12	-.095	.183
13	-.171	.183
14	.020	.183
15	-.183	.183
16	-.127	.183

The Mean Absolute Percentage Error (MAPE) for the ten year bond yield is 11.2. This means that the forecasting inaccuracy is low. This study was concerned with identifying the determinants of the Kenyan government bond yield. Thus, the study did not seek to integrate or differentiate the functions to make the mean in stationary nature.



**Figure 4: 2 ACF AND PACF Graph**

The figure 4.3 indicates that the bond yield had variations between the upper confidence and lower confidence limits. This means that the mean were not stationary. To this end, for forecasting purposes, the data must be made into stationary to enable it be forecasted from the sample taken. This study appreciates that although, time series is a good tool for indicating trend of variables over time, it is not absolute.



**Table 4: 10 Ten year Bond Model fit**

<b>Model Fit</b>											
Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	.769	.	.769	.769	.769	.769	.769	.769	.769	.769	.769
R-squared	.165	.	.165	.165	.165	.165	.165	.165	.165	.165	.165
RMSE	1.874	.	1.874	1.874	1.874	1.874	1.874	1.874	1.874	1.874	1.874
MAPE	11.2	.	11.2	11.22	11.2	11.2	11.2	11.2	11.2	11.2	11.2
MaxAPE	59.674	.	59.674	59.674	59.674	59.674	59.674	59.674	59.674	59.674	59.674
MAE	1.327	.	1.327	1.327	1.327	1.327	1.327	1.327	1.327	1.327	1.327
MaxAE	4.846	.	4.846	4.846	4.846	4.846	4.846	4.846	4.846	4.846	4.846
Normalized BIC	1.477	.	1.477	1.477	1.477	1.477	1.477	1.477	1.477	1.477	1.477

At 95 confidence level, the study has established an R square value of 16.5 % with a stationary R Squared mean of 76. 9%. These measures indicate that if the data was made stationary, thus forecasting could be enhanced. The study has found out that R-square for the bond yield is at 0.165. This means that 16.5 % of the variation in bond yield is explained by variations in government budget deficit, inflation rates and interest rates. This implies that ten year bond which is a long term bond is more likely to be influenced by the determinants under this study more than the shorter termed bonds. Bond yields changes with time to maturity.

#### 4.2.6 ARIMA model for the One year bond

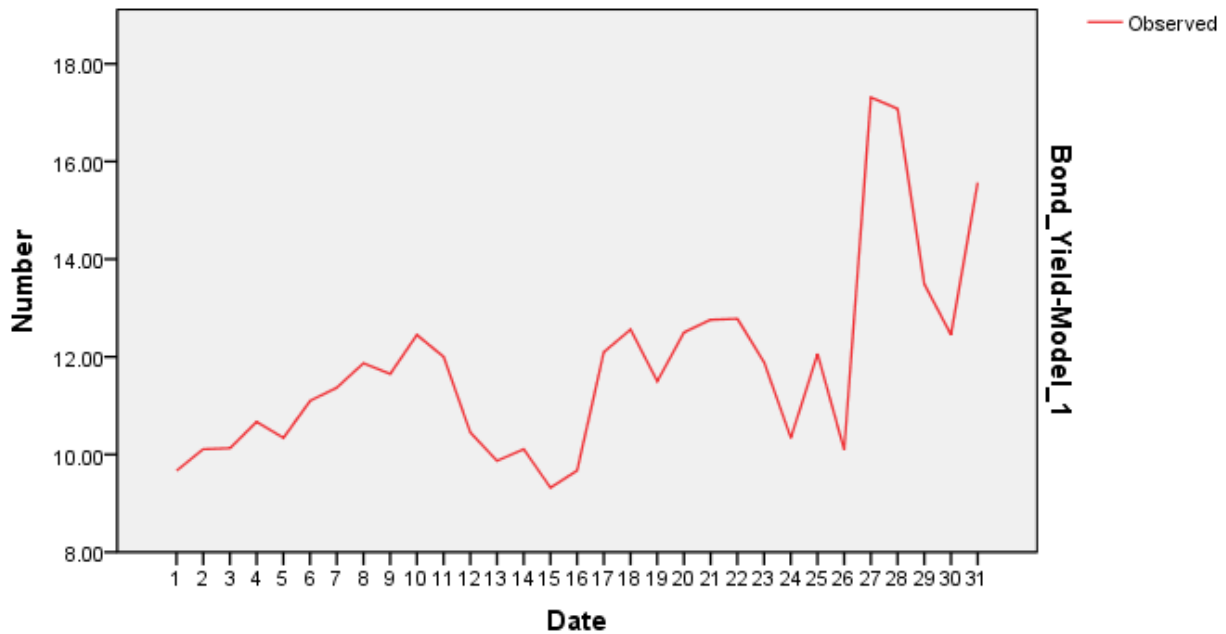


Figure 4: 3 ARIMA Model for One year Bond yield

Figure 4.4 indicates the graph of one year government yield. Like the ten and three year Kenyan government bond, the values changes over time. However, the spikes are relatively dropping without major sharp spikes. Thus, this indicates that the bond yield of the one year government was not changing much in the years the sample was taken

#### 4.2.5 ARIMA Model for the Three Year Bond

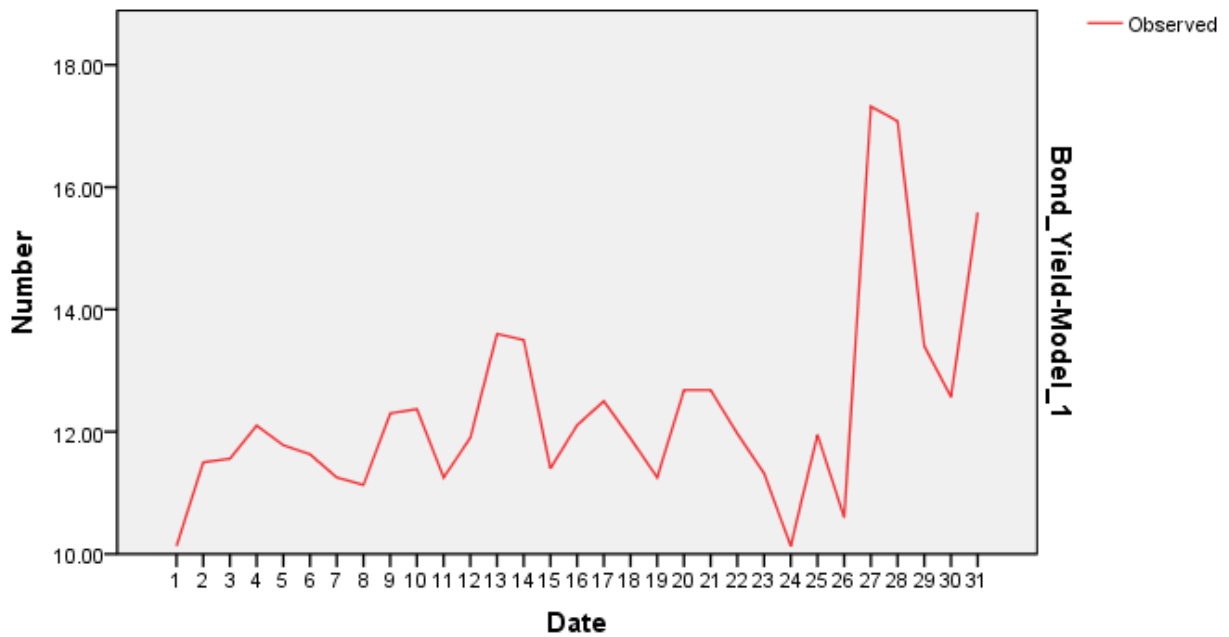


Figure 4: 4 Three Year bond Yield Time Series Graph

Figure 4.3 indicate the oscillations for the kenyan three year government bond yield. The yield spikes were found to be increasing and decreasing at constant rates for the first years of the sample. This data indicates that the yield change significantly during the time data was taken.

**Table 4: 11 Three Year Bond Model Fit**

<b>Model Fit</b>											
Fit Statistic	Mean	SE	Mini mum	Maxi mum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	.661	.	.661	.661	.661	.661	.661	.661	.661	.661	.661
R-squared	.179	.	.179	.179	.179	.179	.179	.179	.179	.179	.179
RMSE	1.551	.	1.551	1.551	1.551	1.551	1.551	1.551	1.551	1.551	1.551
MAPE	8.038	.	8.038	8.038	8.038	8.038	8.038	8.038	8.038	8.038	8.038
MaxAPE	27.48	.	27.48	27.48	27.48	27.48	27.48	27.48	27.48	27.48	27.48
	4	.	4	4	4	4	4	4	4	4	4
MAE	1.033	.	1.033	1.033	1.033	1.033	1.033	1.033	1.033	1.033	1.033
MaxAE	4.760	.	4.760	4.760	4.760	4.760	4.760	4.760	4.760	4.760	4.760
Normalized BIC	1.099	.	1.099	1.099	1.099	1.099	1.099	1.099	1.099	1.099	1.099

Table 4.9 indicated that the R-Squared is 17.9 % while the stationary R-squared is 66.1 %. The MAPE is 8.038 while the Normalised BIC(Bayesian Information criteria) had a value of 1.099. This low BIC indicates that the model could not be used accurately in forecasting the Kenyan government bond yield. However, this study was not concerned with the differentiating or integrating the moving averages that ensures forecasting ability of an ARIMA model.

**Table 4: 12 Model statistics for three year bond**

<b>Model Statistics</b>						
Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
Bond_Yield-Model_1	0	.661	12.359	16	.719	0

The study has found that the R-square at a stationary mean for the three bonds is 0.661. Thus government budget deficit influenced the yield of the 3 year bond on an extent of 66.1 %.

**Table 4: 13 Analysis of ANOVA for Three Year Kenyan Government Bond**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9.276	3	3.092	.665	.581 <sup>b</sup>
	Residual	125.474	27	4.647		
	Total	134.750	30			

a. Dependent Variable: Bond\_Yield

b. Predictors: (Constant), Interest\_Rates, Budget\_Deficit, Inflation\_Rates

The F statistics of the independent variables with bond yield is 0.665 with a P-value of 0.581 which is greater than 0.05. Thus the independent variables affect the Kenyan government bond yield significantly.

**Table 4: 14 Durbin-Watson for Three Year Bond**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.262 <sup>a</sup>	.069	-.035	2.15573	1.117

a. Predictors: (Constant), Budget\_Deficit, Inflation\_Rates, Interest\_Rates

b. Dependent Variable: Bond\_Yield

The study used DW test to check autocorrelation among the variables being investigated. The DW test value was 1.117 which is between 1 and 3. This implied that the data had no autocorrelation.

**Table 4: 15 Model fit for the One Year Government Bond Yield**

<b>Model Fit</b>											
Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	.653	.	.653	.653	.653	.653	.653	.653	.653	.653	.653
R-squared	.334	.	.334	.334	.334	.334	.334	.334	.334	.334	.334
RMSE	1.64	.	1.645	1.645	1.64	1.64	1.64	1.64	1.64	1.64	1.64
	5	.	5	5	5	5	5	5	5	5	5
MAPE	9.43	.	9.438	9.438	9.43	9.43	9.43	9.43	9.43	9.43	9.43
	8	.	8	8	8	8	8	8	8	8	8
MaxAPE	27.5	.	27.59	27.59	27.5	27.5	27.5	27.5	27.5	27.5	27.5
	95	.	5	5	95	95	95	95	95	95	95
MAE	1.13	.	1.135	1.135	1.13	1.13	1.13	1.13	1.13	1.13	1.13
	5	.	5	5	5	5	5	5	5	5	5
MaxAE	4.77	.	4.777	4.777	4.77	4.77	4.77	4.77	4.77	4.77	4.77
	7	.	7	7	7	7	7	7	7	7	7
Normalized BIC	1.21	.	1.217	1.217	1.21	1.21	1.21	1.21	1.21	1.21	1.21
	7	.	7	7	7	7	7	7	7	7	7

Table 4. 14 Shows an R Squared of 33.4 % and a Stationary R of 65.3 %. The Mean Average Percentage Error (MAPE) was 9.438 with a normalized BIC value of 1.217. This indicates that the variables affected the bond yield at a low extent.

**Table 4: 16 Model Statistics for one year bond**

<b>Model Statistics</b>						
Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
Bond_Yield-Model_1	0	.653	16.175	16	.441	0

Table 4.15 indicates that the stationary R squared is at 0.653. This means that 65.3 % of the one year bond yield can be attributed to the predictor variables used in the model. The study has established that the independent variables affect to the dependent variable in a significant extent. For the 1 year bond, the R-square is 0.269. This means that the one year bond yield can be explained to be influenced by government budget deficit inflation and interest rates to the extent of 65.3 % if the data was made to have a stationary mean. Thus, the one year bond yield is influenced by the factors under consideration at this percentage while other factors not considered in the scoped of this study affect the yield by the difference in percentage.

**Table 4: 17 Analysis of ANOVA for one Year Kenyan Government Bond Yield**

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.551	3	2.850	.704	.558 <sup>b</sup>
	Residual	109.243	27	4.046		
	Total	117.794	30			

a. Dependent Variable: Bond\_Yield

b. Predictors: (Constant), Interest\_Rates, Budget\_Deficit, Inflation\_Rates

The F statistic for the Kenyan government bond yield is 0.704 and the P-value is 0.558 which is greater than 0.05 implying that the mean difference of the determinants with government yield is statistically significant at a level of significance of 0.05.

### **4.3. Descriptive Statistics**

#### **4.3.1 Kenyan Government One Year Bond Yield**

The study had sought to establish the yield of the one year Kenyan government bond from the years 1985 to 2015. The study collected secondary data from the Central bank of Kenya and Kenya National Bureau of Statistics. The findings are tabulated in Table 4.1.

Table 4: 18 Descriptive Statistics of Kenyan Government One Year Bond

Descriptive Statistics							
	N	Minimum	Maximum	Sum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Bond_Yield	31	9.32	17.31	365.27	11.7829	.35589	1.98153
Valid N (listwise)	31						

Table 4.19 indicates findings on the one year Kenyan government bond. The study has found a mean yield of 11.78 % in Kenyan government bond yield. The minimum bond yield in the years 1985 to 2015 was at 9.32 % while 17.31 % is the recorded the maximum yield. The study has established a standard deviation of 1.98 %. Thus, the Kenyan bond yield is high. Bond yield is a factor of the effects of government budget deficit, inflation rates and interest rates changes in the macro-economic environment. The study has established that with increase in the rates of these three determinants, there is a chance of significance increase in government bond yields.

Table 4: 19 Skewness and Kurtosis

Skewness and Kurtosis									
	N	Sum	Mean		Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error	Statistic	Std. Error
Bond_Yield	31	365.27	11.7829	.35589	1.98153	1.422	.421	2.149	.821
Valid N (listwise)	31								

Measures of normality are measured by skewness and kurtosis. For a normal distribution they are close to zero and three respectively. The finding in table 4.2 indicates a skewness value of 1.422



and a kurtosis value of 2.149. The skewness is not close to zero and thus the research values are not normally distributed and the kurtosis of 2.1 is not close to three. Thus, the research indicated that the variables do not affect the dependent variable in a normal distribution way. The longer the period to maturity, the higher the bond yield. This is because the long term may be associated with uncertainties in the movements of interest rates and inflation rates. It is for this reason, that bond holders will usually be enticed by a premium interest in order to hold the long term bonds. It should be noted that the interest rate attached to the bond is the bond yield which is inversely proportional to bond prices, other factors held fixed.

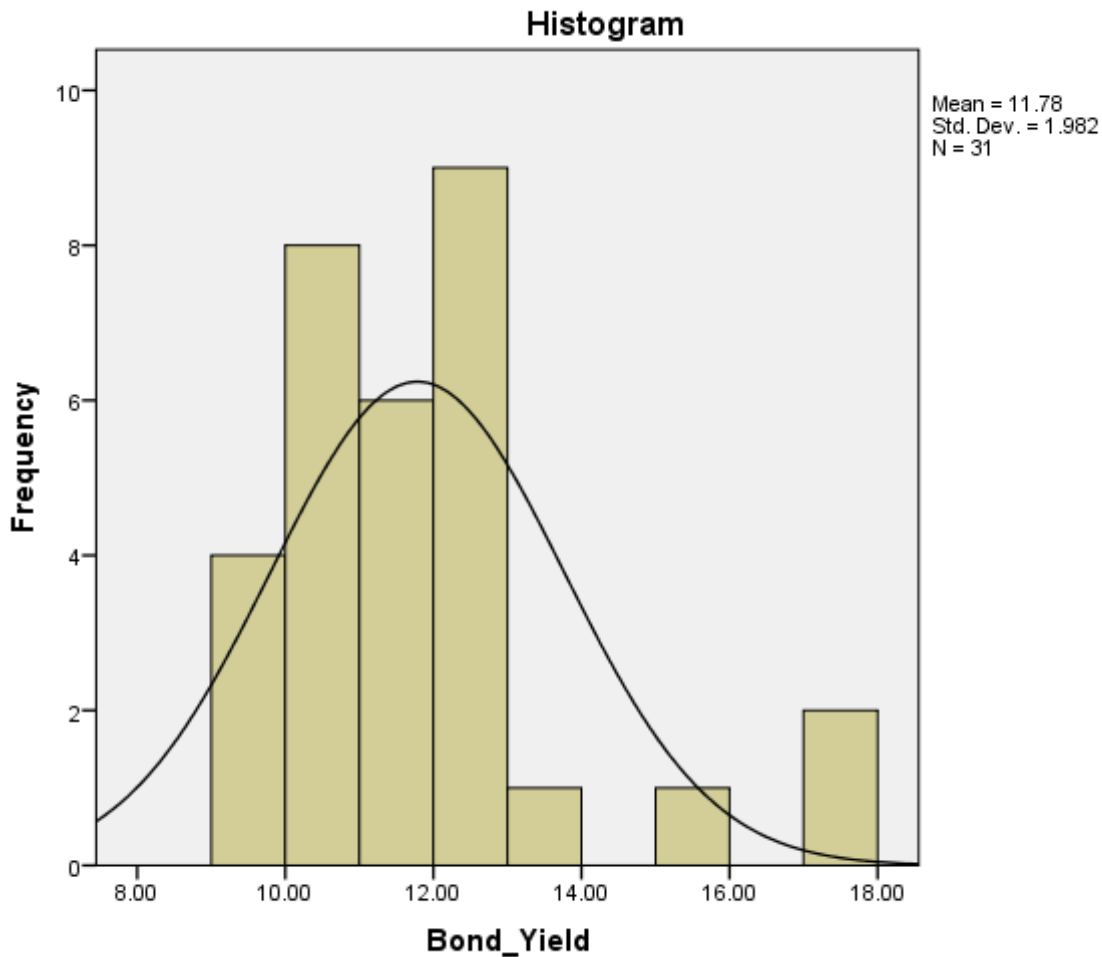


Figure 4: 5Histogram for Kenyan Government One Year Bond Yield

The histogram gives a visual impression of the Kenyan government one year bond yield over the years considered in the study

#### 4.3.2 Kenyan Government 3 Year Bond Yield

*Table 4: 20 Descriptive Statistic for Kenyan Government 3 Year Bond Yield*

<b>Descriptive Statistics</b>									
	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Bond_Yield	31	9.19	8.13	17.32	367.29	11.8481	.38065	2.11935	4.492
Valid N (listwise)	31								

The study had sought to establish the find the yield of government. The study has found that the mean percentage yield for the three year bond is 11.84 % with a standard deviation of 2.12 %. It is expected that bond yield increases with time to maturity. This is because; the longer the time to maturity the more riskier the bond is, ceteris paribus. Where the time to maturity is long, investors expect a premium for holding the bond, hence increases the bond yield. Also, when the time to maturity of a bond is short, the bond investors are willing to pay a premium for acquiring the more liquid short term bonds. The study established that the minimum percentage bond yield of the three year bond was 8.13 % and the maximum yield was 17.32 % in the years 1985 to 2015.

*Table 4: 21 Skewness and Kurtosis*

<b>Skewness and Kurtosis</b>								
	N	Sum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Bond_Yield	31	367.29	11.8481	2.11935	.817	.421	1.439	.821

Valid N (listwise)	31						
-----------------------	----	--	--	--	--	--	--

The skewness is 0.817 which is close to zero and thus may portray that the independent variables affect the dependent variable in a normal distribution case. The kurtosis is 1.4 which is not close to three and thus the research finds that the curve is not entirely normally distributed. Bond yield is a function of several variables and thus the curve established by the descriptive statistics is not normally distributed with respect to the three variables being considered by the study.

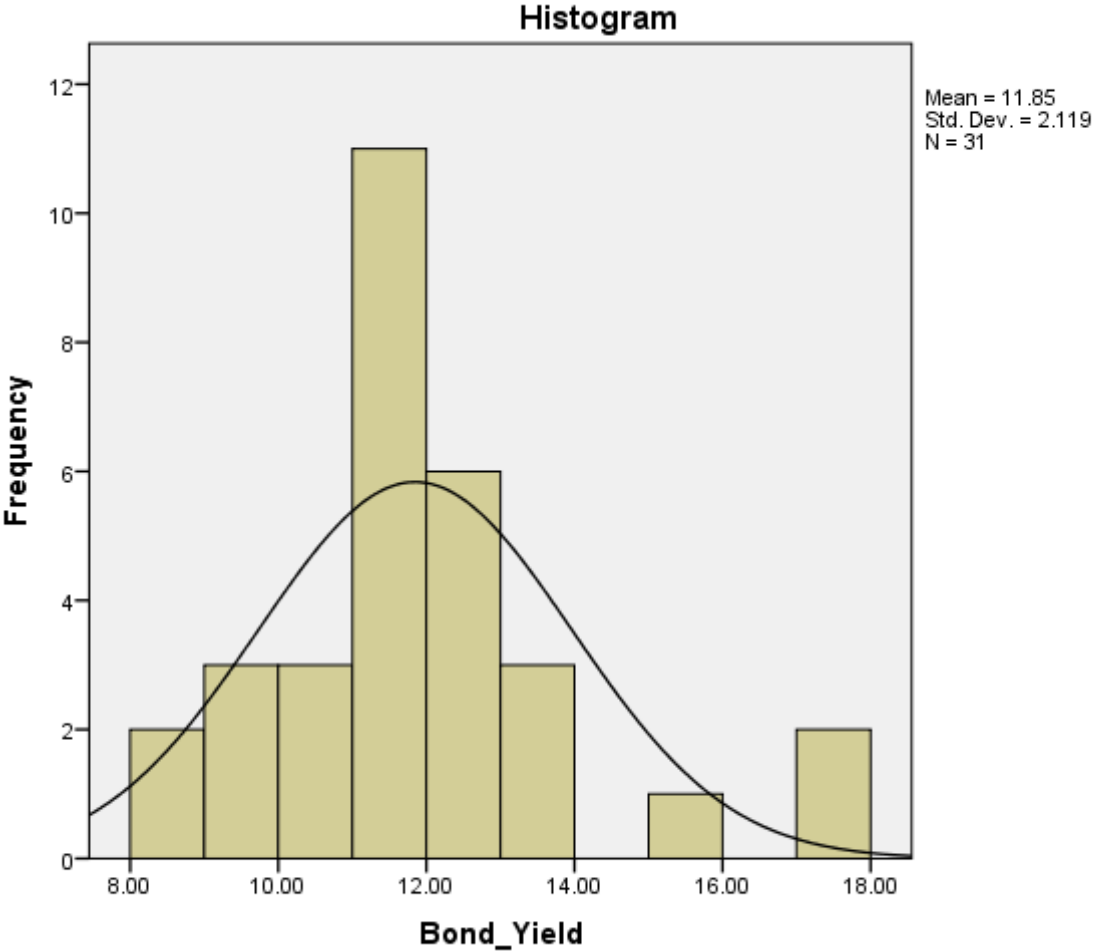


Figure 4: 6Histogram for Kenyan Government 3 Year Bond

The histogram in Figure 4.8 gives a clear impression of the three year Kenyan government bond yield.

#### 4.3.3 Kenyan Government 10 Year Bond Yield

**Table 4: 22 Descriptive Statistics for 10 Year Kenyan Government Bond Yield**

Descriptive Statistics								
	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Bond_Yield	31	8.95	8.12	17.07	383.56	12.3729	.36213	2.01627
Valid N (listwise)	31							

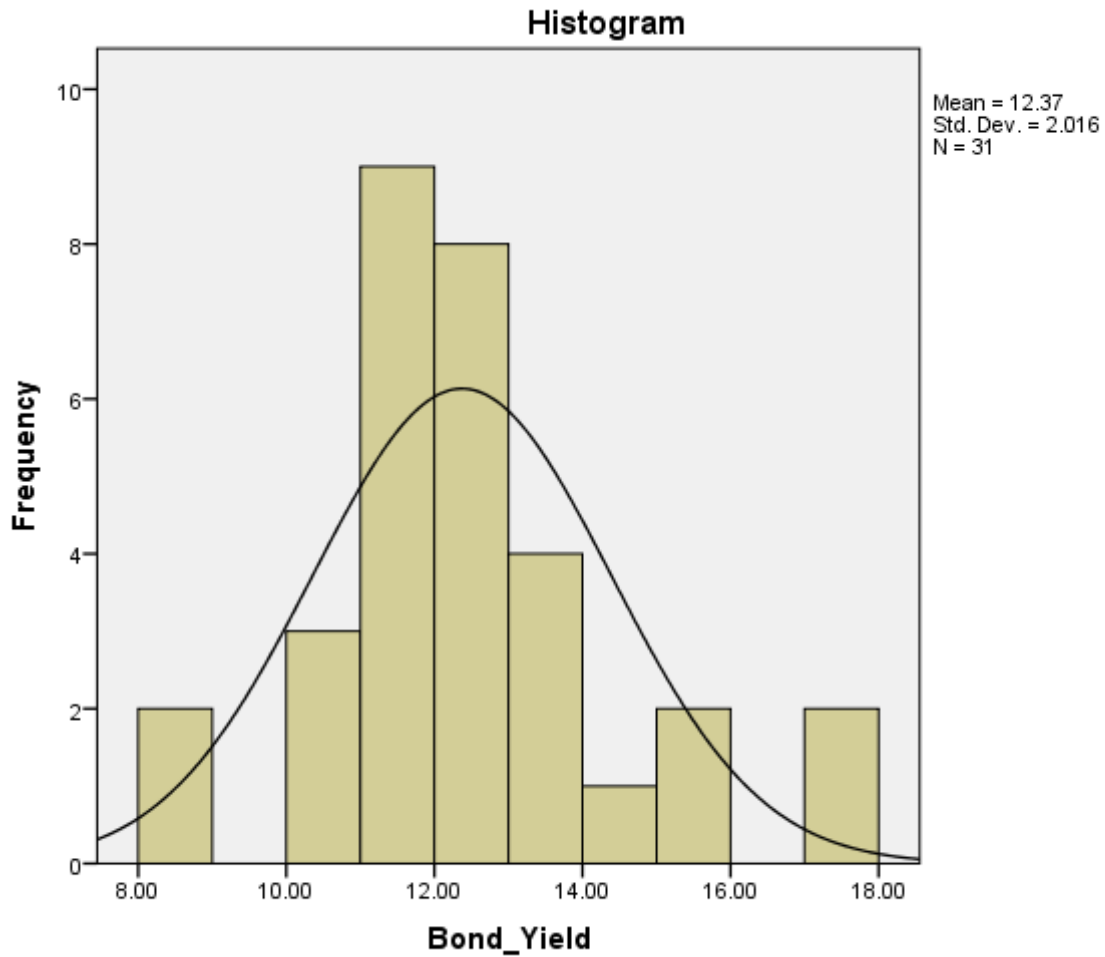
The study had sought to establish the yield of the Kenyan 10 year government bonds. The study found out that ten year bond had a mean bond of 12.37 % in the years 1985 to 2015. The ten year bond reached a maximum yield of 17.07 % in the years with a lowest of 8.12%. The standard deviation was at 2.01 %. Government bonds are denominated in different times to maturity. Shimizu *et al* (2012), found that increase in government budget deficit will increase the yields of bonds. Their study found out that the increase in Japan's government bond increases the bond yield forward rates. The study also found out that expected decreases in inflation decreases the expected forward rates.

**Skewness and Kurtosis**

	N	Sum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Bond_Yield	31	383.56	12.3729	2.01627	.474	.421	.761	.821
Valid N (listwise)	31							

*Table 4: 23 Skewness and Kurtosis*

The skewness of 0.421 indicates a normal distribution. This is not confirmed by the kurtosis of 0.761 which is not close to three. Thus, when both do not give consistent results it means that the variable do not relate on a normal distribution case.



*Figure 4: 7Histogram for 10 Year Kenyan Government Bond Yield*

The Histogram in figure 4.9 shows a clear impression of the Kenyan government ten year bond yield. The curve I skewed to the left thus most yield are more than the mean value.

## CHAPTER FIVE

### CONCLUSION AND RECOMMENDATIONS

#### *5.1 Introduction*

This chapter provides a summary of the findings, the discussion, conclusions and recommendations of the study based on the objectives of the study. It is important to note that the conclusions and recommendations are limited to the objectives of the study. For this reason, the study wishes to caution that the conclusions are those related to data analysis presented in chapter four. To the least, this chapter harbours the summary of the test for hypothesis as established by the dissertation. The chapter finally presents the suggestions for further studies and research as identified by the findings of this study.

#### *5.2 Summary of Major Findings*

This section contains the summary of the study findings respective to the objectives. This summary is based on the data analysis so far presented in chapter four.

The ARIMA model is suitable in predicting the trend of variables over time. The study had adopted both time series analysis and regression analysis in order to meet the objectives. The time series analysis indicated that the mean of the three bonds were not stationary. Thus, the model was to be integrated in order to make it fit for forecasting. However, the study did not need to make the data stationary since it was beyond the scope of this study. This study had the objectives of establishing the determinants of the Kenyan Government bond yields. However, the study ruled out any effect of autocorrelation between the independent variables and thus the findings were statistically acceptable.

From the findings of the study discussed in chapter four above, the study established that the most influencing factor on determinants of Kenyan government bond yields is government budget deficit, followed by interest rates and finally inflation rates. Of importance, is the fact that

these determinants do not work in isolation( they are not mutually exclusive) but rather it is the confluence of all of them that determine the Kenyan government bond yields.

In as much as the independent variables have been found to have influence on the yield of the Kenyan Government bonds, they do not work in isolation. Other factors that were beyond the scope of this research have the capability of affecting the yield. The government is responsible for normalizing macro-economic conditions through fiscal and monetary policies. For instance, where the rates of inflation are high, the government may increase interest rates thus lowering credit supply in the economy. This will have effect on the bond interest rates too. Also, on household level the risk appetite will influence the demand and prices of bonds thus determining the yield of the government bonds.

### ***5.2.1 Government Budget Deficit and Yield of the Kenyan Government Bonds***

On whether budget deficit determines the yield of the Kenyan government bond, the study has established that there is a negative relationship between government budget deficit and bond yield. An increase in government budget deficit decreases the bond yield. The rate of return on government bonds is particularly influenced by macro-economic condition including government budget deficit. For instance when the government budget deficit is on the rise, it means that the government must borrow funds in order to finance the deficit. Thus, the government will raise money either internally or externally. The government may issue treasury bills or treasury bonds. When the government borrows internally it scares away the private borrower through crowding out effect. This is because, the government is the best borrower, obviously because under normal circumstance, it cannot fail to service its debts. It is for this reason that an increase in government budget deficit/GDP ratio will more likely than not increase in yield of the Kenyan government bond. The study has established that Kenya has shown considerable increase in deficit budget in the years 1985 to 2015. This is because of the expansion in economic activities and the promulgation of the new system of state governance with county governments on board. Thus, the taxation policies have not adequately met the budget requirement of the country. It is for this reason that the government issued bonds on monthly basis. This study has established that increase in budget deficit significantly affects the yield of the Kenyan government bond.



This finding contradicts Hysing Yu (2015), who established that bond yield in Spain is positively related with government debt carried a research on the “Determinants of the Government Bond Yields in Spain: A Loanable Funds Model”. According to Gruber and Kamin(2012)carried a research on “Fiscal Positions and Government Bond yields in OECD” and found out that a rapid expansion in government debt may require an increase in interest rates hence increase the bond yield

### ***5.2.2 Inflation Rates and Yield of the Kenyan Government Bonds***

On whether changes in inflation rates affect the yield of the Kenyan government bonds, the study has established that there is a positive relationship between the two variables. Inflation affects the yield of government bond in two ways; when the expected rate of inflation is high investors expect a premium to compensate for the loss in purchasing power of money and when the expected rate of inflation is low, it follows that that investors will seek less compensation for loss of purchasing power. In Kenya, inflation has been on the rise and in the years of study the rates are at different margins. The rate of interest on the bond measures the yield of the bond. It is important to note that inflation will likely lower the prices of the bonds. Thus, the yield will decrease. Conventionally, there is a negative relationship between bond prices and bond yields. For all the three bonds considered in this study, the changes in inflation affects their yields. In Kenya, the government has had to work out measures to curb the escalation rates of inflation. It is also worthwhile to note that inflation is measured by the consumer price index. The bond investors expect that the rate of return on the bond yield be high enough to compensate on the rate of inflation. Thus, the bond will carry a premium rate in inflationary economies; hence Kenyan government is no an exemption. Also, there is a tendency of bond investors to prefer floating rate bonds to fixed rate bonds. These findings are consistent with Reid C., Frederic D. and Ian. C,(2004), who established that there is a positive relationship between inflation and government bond yield. According to the market power theory of inflation monetary policies are used to regulate macroeconomic aspects in the state. For instance where there are high inflations, the regulators tends to increase the interest rates offered to bond holders, thus increasing the yield of the government bonds.

### ***5.2.3 Interest Rates Changes and the Yield of Kenyan Government Bonds***

On whether interest rates determine the yield of Kenyan government bonds, the study has established that there is a positive relationship between the two variables. Interest rates changes are the variations of interest rates prevailing in the market. In most developing countries the accessibility of credit is always on compromise. This is because; the financial markets and institutions are charging interests that are a bar far above the reach of many investors. The rates of borrowing are and have been raising high particularly under the period under consideration in this study. The study had sought to establish the effect of interest rates changes on the yield of Kenyan government bonds. To this end, the study has established interest rates are the most significant factor on Kenyan bond yields. Perhaps, this is because interest rates have a bigger role on economic conditions. Poghosyan (2013) also noted that interest rates will affect government bond yields. Also (Gruber and Kamin,2012) found out that there is a positive and largely significance relationship between bond yields and the prevailing interest rates. According to the liquidity preference theory, investors are willing to pay a higher price for assets that are more liquid. Thus, where most bond investors are in need of liquid financial assets, the demand goes up and then the price decreases. It has been generalized that an increase in price of bonds lowers the yield.

### ***5.3 Conclusions***

The Study concludes that the ARIMA model may not be accurate in forecasting the trend in the Kenyan government bond yield. This is because of the lack of stationarity which is a core principle of times series analysis. Thus, forecasting was not done, which secondly did not fall under the scope of this study. Nevertheless within the scope of the study, the study has sufficient and appropriate evidence to predict that the trend is upward. In other words the yield of the Kenyan government bond is rising as depicted by the graphs during the period in which the sample was taken.

The study had set out to establish the determinants of Kenyan government bonds yield. The government of Kenya does issue bond of different denominations in order to finance it deficit.

The issuance of the government bonds to the individual and corporate investors is an indication that the government expects to get money in future to finance the instalments and the principal as and when they fall due. It is crucial to note that the government is a good payer. Most investors will then, prefer government bonds to corporate bonds. It is for this reason that due to the demand of the government bond increasing in the secondary market, the price decreases. The principle of an increase in bond price lowers the yield of the government bond. There is an inverse relationship between bond price and bond yield.

Inflation rate is principally measured in terms of consumer price index. An expected increase in inflation rates leads to an increase the Kenyan government bond yields. This is because; increased inflation lowers the purchasing power of money in the economy. It is for this subtle reason that an increase in inflation makes the bond investors demand for a premium rate of return.

Interest rates changes on bond yield is the most influencing factor on bond yield in Kenya. The study further, concludes that interest rates are significant to all the three bonds considered in the study. Interest rates affect most segments of the economy. Both short term and long term bonds are affected by the rates of interests prevailing in the economy. As interest rates increases, the government bond yields increases. This is because, most investors will subscribe to the bonds since the prices will have decreased.

#### ***5.4 Recommendations***

Based on the above presentations of summary and conclusion, the study makes the following recommendations with respect to the specific determinants of Kenyan government bonds:

The study recommends that the national government plan its fiscal policies in a way to reduce the government budget deficit. This is because the government is a good borrower and would cause a “crowding out” effect in the economy. This in turn will ensure that the bond yields are operating in normal circumstances without the influence of outlying factors. It is important also, for the government to consider lowering the frequency of borrowing from the public. If this is not checked, the private sector will be locked out of funds and hence stagnate. The government

bond yields are important to the bond investors. However, the rate of returns should be critically evaluated in order not to burden the government on the payment periodic instalments. Where most funds of the government are used to pay recurrent expenditures, it may compromise the delivery of public goods and services.

The government should also check on the fiscal policies to stabilise the inflation rates. Although, as per the findings the rise in inflation may lead to increase in government bond yields, the government may not be at a favourable position. This will lead to more money being used to pay the bond investors as premiums. Equally, the study recommends that bonds investors should make purchase decision in full recognition of the expected rate of inflation. In the event that the bond investors does not consider the inflation rates in the economy, it will make them lose money since the future cash flow from the bond payments will have lower purchasing power due to inflation. The rate of return of the investment will thus be lower when the effect of inflation will be considered.

There is a need for bond investors to consider the prevailing interest rates before they purchase the bonds. The rate of return on bonds is the rate of interest attached to the particular bond under consideration. The government bond that pay interest are referred to us coupon bonds. The bond investor should thus consider the coupon rate before finalising on the decision to buy. Although, the government is regarded as a good borrower with lower risks of defaulting, there may be other avenues that may fetch more return than government bonds. For instance, the investors should consider Fixed Deposit Reserve (FDR) that may pay more interest than the government bonds. However, this depends on the risk appetite of the investors. Risk seekers investor goes for more risky investments expecting more returns while risk averse investors are reluctant to take up risky investments. In financial terms, generally, the higher the risk, the higher the expected returns. To the government, interest rates in the market are an indicator on how to price and rate the treasury bonds. The government should, thus commence moves on fiscal policies in order to keep the interest rate as low as possible. The study thus, recommends measures be put in place to control interest rate charging in the economy.

### ***5.5 Suggestions for Further Research***

The general objective of the study will be to establish the determinants of Kenyan government bonds yield. The study concentrated on one, three and ten year Kenyan government bond on a cross sectional period of 1985 to 2015. This study considered inflation rate, interest rates and budget deficit as the independent variables. The study suggest that another study be carried out on determinants of Kenyan bonds with specific emphasis on foreign exchange fluctuations, bond denominations and bond coupon rates.

### ***5.6 Limitations of the Study***

The major limitation of the study was in getting information on a timely fashion from the government departments. The information retrieval process from the sources was not easily carried out. To mitigate this shortcoming the researcher used a letter of introduction from the university that ensured that historical data on bonds was to be used for academic purpose only. Also, the time frame of this study was a limitation since it was a cross sectional study and data were collected for a period of 31 years. Historical data retrieval from the libraries was demanding as there are a few number of empirical studies done in Kenya with respect to the bond yield.

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## APPENDICES

### *APPENDIX .A: Letter of Introduction*

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

I am a Master of Science degree student at KCA University. I am carrying out a research study titled “**DETERMINANTS OF KENYAN GOVERNMENT BOND YIELDS**” and the aim of this letter is to seek permission to collect information related to this topic from your government department/institution. The researcher pledges that the information given shall be treated with strict confidence. Furthermore, the information will be solely used for academic purpose.

However your participation in this exercise is voluntary

Thank you,

Yours sincerely,

Signature.....

Salome K. Balazi.

***APPENDIX .B: Real Interest Rates in Kenya***

*Table Real Interest Rates in Kenya*

<b>Year</b>	<b>Real Interest rates (annual averages in %)</b>
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<b>1985</b>	1.83
<b>1986</b>	5.75
<b>1987</b>	7.33
<b>1988</b>	6.82
<b>1989</b>	8.03
<b>1990</b>	8.16
<b>1991</b>	4.86
<b>1992</b>	5.26
<b>1993</b>	3.98
<b>1994</b>	4.82
<b>1995</b>	8.01
<b>1996</b>	7.61
<b>1997</b>	5.05
<b>1998</b>	9.77
<b>1999</b>	17.30
<b>2000</b>	17.81
<b>2001</b>	15.33

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<b>2002</b>	17.45	
<b>2003</b>	21.10	
<b>2004</b>	16.88	
<b>2005</b>	5.78	
<b>2006</b>	15.80	<b>(Source: KNBS)</b>
<b>2007</b>	16.43	
<b>2008</b>	3.41	
<b>2009</b>	8.14	
<b>2010</b>	11.83	
<b>2011</b>	3.68	
<b>2012</b>	9.45	
<b>2013</b>	11.68	
<b>2014</b>	8.36	
<b>2015</b>	8.93	

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**APPENDIX .C: Inflation Rates in Kenya for the period 1985 to 2015**

*Table 1: Inflation Rates in Kenya*

<b>Year</b>	<b>Annual average Inflation Rates (%)</b>
<b>1985</b>	13.01
<b>1986</b>	2.53
<b>1987</b>	8.40
<b>1988</b>	12.26
<b>1989</b>	13.79
<b>1990</b>	17.78
<b>1991</b>	20.08
<b>1992</b>	27.33
<b>1993</b>	45.98
<b>1994</b>	28.81
<b>1995</b>	1.55
<b>1996</b>	8.86
<b>1997</b>	11.36

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<b>1998</b>	6.72
<b>1999</b>	5.74
<b>2000</b>	9.98
<b>2001</b>	5.74
<b>2002</b>	1.94
<b>2003</b>	9.82
<b>2004</b>	11.62
<b>2005</b>	10.31
<b>2006</b>	14.45
<b>2007</b>	9.76
<b>2008</b>	26.24
<b>2009</b>	11.41
<b>2010</b>	5.61
<b>2011</b>	7.99
<b>2012</b>	14.28
<b>2013</b>	5.56
<b>2014</b>	6.81

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2015	6.54
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*(Source: KNBS)*

**APPENDIX .D: Government Budget deficit for the period 1985 to 2015**

**Table 2: Kenyan Government Budget Deficit to GDP**

<b>Year</b>	<b>Kenyan government Budget deficit(Deficit to GDP ratio in Percent)</b>
<b>1985</b>	-3.70
<b>1986</b>	-1.94
<b>1987</b>	-7.20
<b>1988</b>	-0.54
<b>1989</b>	-8.91
<b>1990</b>	-2.76
<b>1991</b>	-1.61
<b>1992</b>	-0.19
<b>1993</b>	-3.41
<b>1994</b>	-2.34
<b>1995</b>	-5.07
<b>1996</b>	-0.78



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<b>1997</b>	-0.58
<b>1998</b>	0
<b>1999</b>	0
<b>2000</b>	1.98
<b>2001</b>	2.00
<b>2002</b>	1.99
<b>2003</b>	-2.20
<b>2004</b>	-1.47
<b>2005</b>	-1.49
<b>2006</b>	-2.03
<b>2007</b>	-2.54
<b>2008</b>	-3.46
<b>2009</b>	-4.94
<b>2010</b>	-7.21
<b>2011</b>	-4.50
<b>2012</b>	-4.70
<b>2013</b>	-5.60

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<b>2014</b>	-8.00
<b>2015</b>	-8.10

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**(Source: KNBS)**

*APPENDIX E .Kenya Government Bonds Yield from 1985 to 2015*

<b>Year</b>	<b>10 Year Kenyan Government Bond yield</b>	<b>3 Year Kenyan Government Bond yield</b>	<b>1 year Kenyan Government Bond yield (%)</b>
<b>1985</b>	11.23	10.13	9.67
<b>1986</b>	10.13	11.50	10.11
<b>1987</b>	10.60	11.56	10.13
<b>1988</b>	10.67	12.10	10.67
<b>1989</b>	11.15	11.78	10.34
<b>1990</b>	11.45	11.63	11.10
<b>1991</b>	12.56	11.25	11.37
<b>1992</b>	11.00	11.13	11.87
<b>1993</b>	12.59	12.30	11.65
<b>1994</b>	12.45	12.37	12.45
<b>1995</b>	12.90	11.25	12.00
<b>1996</b>	11.50	11.90	10.45

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<b>1997</b>	13.50	13.60	9.87
<b>1998</b>	11.40	13.50	10.11
<b>1999</b>	13.65	11.40	9.32
<b>2000</b>	11.34	12.11	9.67
<b>2001</b>	12.00	12.50	12.10
<b>2002</b>	13.70	11.89	12.56
<b>2003</b>	12.40	11.25	11.50
<b>2004</b>	8.12	12.68	12.50
<b>2005</b>	11.00	12.68	12.76
<b>2006</b>	15.00	11.97	12.78
<b>2007</b>	14.00	11.32	11.89
<b>2008</b>	12.90	10.13	10.34
<b>2009</b>	11.89	11.95	12.06
<b>2010</b>	8.82	10.60	10.10
<b>2011</b>	17.07	17.32	17.31
<b>2012</b>	17.02	17.08	17.08
<b>2013</b>	13.48	13.40	13.49

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<b>2014</b>	12.53	12.57	12.45
<b>2015</b>	15.51	15.59	15.57

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***APPENDIX .F: Gantt Chart***

The Gantt chart below provides the duration of each task as per the research study project and specific study engagements. The researcher had to determine the tasks needed to be done and the duration of each task in order to create an appropriate schedule for the research study. The Gantt chart is scheduled for three months.

*Table 3: Gantt Chart*

<b>Task Name</b>	<b>Week 1-4</b>	<b>Week 5</b>	<b>Week 6</b>	<b>Week 7-8</b>	<b>Week 8-9</b>	<b>Week 10-11</b>	<b>Week 12</b>
Writing Proposal							
Defense of proposal							
Post Presentation Reviews							
Data Collection							

Data coding and Editing							
Data analysis							
Report Writing							

**APPENDIX .G: Research Budget**

Table 4: Research Budget

<b>NO.</b>	<b>ITEM</b>	<b>AMOUNT(KSHS)</b>
<b>1</b>	<b><i>Proposal Writing</i></b>	
	i. Traveling expenses	3,000.00
	ii. Typing & printing 50 pages @ 10/=	500.00
	iii. Photocopying 2 copies @ 3/= per page	300.00
	iv. Binding 2 copies @ 120/=	240.00
	v. Miscellaneous	600.00
	<i>Sub-Total</i>	<b>6,800.00</b>
<b>2</b>	<b><i>Estimated Cost of Project</i></b>	
	(a) Data Collection and Analysis	
	i. Traveling and data collection expenses	5,000.00
	ii. Computer data entry and analysis	10,000.00
	<i>Sub-Total</i>	<b>15,000</b>
	(b) Production & Final Document	
	i. Typing 82 pages @ 30/=	2,460.00
	ii. Photocopying 5 copies @ 3/=	1,230.00
	iii. Binding 2 copies @ 400/=	800.00
	iv. Miscellaneous	2,800.00
	<i>Sub-Total</i>	<b>6,190.00</b>
	<b>GRAND TOTAL</b>	<b>27,990.00</b>