EFFECT OF MACROECONOMIC FACTORS ON THE PERFORMANCE OF THE BOND MARKET IN KENYA

BY

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MASTERS OF SCIENCE (FINANCE AND INVESTMENT)

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DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this paper contains no material written or published by other people except where due reference is made and author duly acknowledged.

Sign: _____ **KCA 09/2442**

Date: _____

I do hereby confirm that I have examined the master's dissertation of

Mwaniki Mugo

And have certified that all the revisions that the dissertation panel and examiners recommended have been adequately addressed.

Sign _____ Date _____

Dr. Christine Nanjala

Dissertation Supervisor

ABSTRACT

A predictable and stable macro-economic environment leads to a robust bond markets in a country. The main objective of the study was to determine the effect of macroeconomic factors on the performance of the bond market in Kenya. Specifically, the study sought to determine the effect of foreign exchange rate on bond market performance in Kenya; to assess the effect of interest rate fluctuations on bond market performance in Kenya; and to investigate how inflation rate affects bond market performance in Kenya. This study adopted a longitudinal research design. The population in this study constituted the entire bond market in Kenya. The population of this study was drawn from quarterly bond market Index data for a period of 10 years from 2007 – 2017. Secondary data was collected for the study. The researcher obtained quarterly data for the variables. This study used descriptive and inferential statistics to analyze the data. Data analysis was done using STATAv13. Diagnostic tests were done to establish whether the model and variables are significant. The data was presented in form of tables. The long run regression results showed that the effect of macroeconomic factors on bond performance existed. The VECM findings showed that there was a short run relationship between the macroeconomic factors and bond performance. There was a negative effect of exchange rate and interest rate on bond performance. However, inflation rate displayed a positive relationship with bond performance in the short run. This study recommends that policies on exchange rate and interest rate be observed closely to control the variables as they affect bond performance negatively. The study also recommends a strict monetary policy and control of factors contributing to change in inflation rate in order to enhance bond performance. This study recommends further studies to be done using other macro-economic variables to understand their contribution to bond performance in Kenya.

Key Words: Inflation, Interest, Exchange rate, Bond, Bond Market, macro-economic

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DEDICATION

I dedicate this work affectionately to my lovely wife; Donnah Mwaniki, my daughter; Ms. Elaine Mutono; my parents Michael & Julia, my brothers: Gatimu, Macere & Nyaga and colleagues and friends for their unrelenting inspiration, support and encouragement during the period of the study. They gave me the necessary drive and discipline to handle tasks with zeal and resolve. This thesis would not have been made possible without their love and support.

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ACRONYMS AND ABBREVIATIONS

ARDL	Autoregressive Distributed Lag
CAPM	Capital Asset Pricing Model
CBK	Central Bank of Kenya
CBR	Central Bank Rate
CMA	Capital Markets Authority
CPI	Consumer Price Index
ECM	Error Correction Model
EMH	Efficient Market Hypothesis
EU	European Union
GDP	Gross Domestic Product
IMF	International Monetary Fund
KNBS	Kenya National Bureau of Statistics
MTDS	Medium Term Debt Strategy
NSE	Nairobi Securities Exchange
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
RER	Real Effective Exchange Rate
UK	United Kingdom
USA	United States of America
VEC	Vector Error Correction
VECM	Vector error correction model

OPERATIONAL DEFINITION OF TERMS

Bond This is a fixed income investment in which an investor loans money to an entity (typically corporate or governmental) which borrows the funds for a defined period of time at a variable or fixed interest rate.

Bond Market This is a financial market where participants can issue new debt or buy and sell debt securities.

Exchange rate This is the price of a nation's currency in terms of another currency. In this study it is defined as the price of the Kenyan shilling in terms of the US dollar.

Inflation rate This is the percentage change in the monthly consumer price index (CPI) over a given period of time

Interest rate This is the amount earned on interest-bearing deposits. In this study it relates to the amount earned on bonds.

Macro-economic This is the branch of economics that studies the behavior and performance of an economy as a whole.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Financial markets are markets in which funds are transferred from people who have an excess of available funds to people who have a shortage. Financial markets such as equity and bond markets are crucial to promoting greater economic efficiency by channeling funds from people who do not have a productive use for them to those who do. A well-functioning financial market is a key factor in producing high economic growth and vice versa (Mishkin & Eakins, 2012). A bond market is an important component of a developed financial market. Due to its positive influence on the development of an economic and financial system, and the numerous advantages that a bond market provides, the development of a bond market remains critical to a country's financial system and economy (Sprcic & Wilson, 2017).

A bond is a financial debt instrument requiring the issuer (borrower) to repay to the lender the amount borrowed plus interest over a specified period of time. The issuer of the bond will repay to the lender/investor the amount borrowed (principal) plus interest over a specified period of time (Fabella & Madhur, 2013). A bond market is the environment in which the issuance and trading of debt securities occurs. The bond market typically constitutes international and domestic bonds. A domestic bond primarily includes; government bonds, municipal bonds and corporate bonds, and facilitates the transfer of capital from savers to the issuers or organizations requiring capital for government projects, business expansions and ongoing operations (Welch, 2009). Macroeconomics is concerned with the economy as a whole.

Factors that typically influence the bond market vary and include a range of macro level, industry level, market level and firm level factors (Sprcic & Wilson, 2017). Literature has provided several: regulatory enforcement; absence of public sector funding needs; banking concentration; corporate governance and transparency; law and order; size of an economy; the stage of economic development; the openness of an economy; among others. The bond market in Kenya plays a pivotal role in fostering economic development in the country through offering investment opportunities to both local and foreign investors and also financing the government budget deficit.

Bonds tend to yield better if the macroeconomic factors are stable and favorable (Ringui, 2012). Bonds are regarded as volatile securities. The volatility of the bond is the rate of change in its trading prices (Mbugua, 2013). Infrastructure bonds issued by the government of Kenya to finance specific projects tend to be less volatile since they are long term 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.

An efficient, well-regulated and market driven banking sector fuels bond market development. The demand for bonds is sourced from a banking system based on the marketing principles and with no politics interfering with the system (Yoshitomi & Shirai, 2011). There is market orientation in banks with clear rules and a stable macroeconomic environment. This has facilitated the rapid growth of the bonds market in countries like China, Australia, Taipei and Hong Kong. In these countries, the purchase of corporate bonds has been high. This has seen increased robustness in the countries financial sector operating on market principles which has reinforced the bond market (Brouwer, 2012).

1.1.1 Macroeconomic factors

Romer (2012) defines macroeconomics as the study of the economy as a whole. The study states that macroeconomics focuses on the behaviour of an entire economy. Brunner (2012) defined macroeconomic variables as those that are important in the broad economy at either the regional or national level. These variables also affected the whole population and not only a few select people. The variables identified in the study as having a major influence included the following: gross domestic product (GDP), interest rates, inflation, currency exchange rate, legal and regulatory environment and risk. These variables matter to all stakeholders ranging from business owners, consumers, the government, commercial and service firms. These factors are important to Nairobi Securities Exchange since they have a direct impact its performance.

Aguiar and Broner (2016) refer to inflation as a persistent or sustained increase in the prices of services and goods in the long term.This is caused by a rise in earning which is not proportional to the increase in production of products and services. This results in more money chasing few goods general prices of goods and services which leads to a significant reduction in disposable income. Interest rate can be defined as the cost expressed as a percentage of the principal (the amount

borrowed) charged by the lender to the borrower for lending the money. Interest rates are usually charged per month or year (per annum) and its levels are determined by and are directly proportional to the risk levels of the borrower. Thus, the amount borrowed should be invested in activities or use that generates more return than the lending rate so as to make economic sense (Doumpos & Gaganis, 2012).

Schiller (2008) defines exchange rate as the amount of local or home currency essential to acquisition of a one unit of a foreign currency. The exchange rate affects the relative prices of domestic and foreign goods and the foreign demand for local goods (Ncube & Ndou, 2011). Variations in foreign exchange rates can be measured in real and nominal terms, but most studies have utilized nominal exchange rates. Gross Domestic Product (GDP) is the real market value of the aggregately recognized finished goods and services that have been produced within a country in a given period (Schiller, 2008). Mwangi (2013) states that (GDP) is the most commonly used macroeconomic indicator to measure total economic activity within an economy; the growth rate of the GDP reflects the state of the economic cycle.GDP is measured either with the income approach or the expenditure approach. GDP is considered the broadest indicator of economic growth and economic output.

A range of macro-level, industry level, market level and firm specific factors influence the rate at which bond markets develop (Sprcic & Wilson, 2017). Regulatory enforcement; absence of public sector funding needs; banking concentration; corporate governance and transparency; law and order; riskiness of investment environment; geographical/disease endowment environment; interest rate variability was observed to have a huge impact on bond market development (Eichengreen & Luengnaruemitchai, 2014). The size of an economy, the exchange rate variability, the exchange rate; and interest rate variability were found to be the key macroeconomic variables that affected bond market performance (Bhattacharyay, 2013).

1.1.2 Performance

Instruments classified as Debt securities are generally referred to as bonds because of their fixed income characteristics except for preference stock which is a hybrid instrument. A bond is a certificate of indebtedness issued by a borrower to a lender. Therefore, investors in bonds are

essentially lending money to the issuer. The bond market is the channel through which government and corporations that need to borrow money are matched with investors who have funds to lend.

According to Thomas (2015), financial instruments such as bonds have three attributes, such as performance, risk and yield, which are systematically related. A key element of market microstructure, performance is defined as the ability of a market to absorb a large number of transactions without dramatically affecting price. The absence of performance for an asset implies difficulty in converting it into cash, and generally reduces incentives to hold the asset, unless a countervailing premium is offered. Performance is to markets as oxygen is to humans only noticeable by its absence (Das, Ericsson & Kalimipalli, 2013).

For an economy to benefit maximally from a bond market, then it must be that this market is liquid, efficient and less volatile (Mbewa et al., 2014). Performance is a hallmark of an efficient and active market, and hence a useful indicator of market development. It is normally reflected in a high level of turnover relative to market size, and general price stability. The more liquid a market is, the more information-efficient the secondary-market prices are likely to be (Holstrom & Tirole, 2017). Liquid markets offer a number of benefits. They render financial assets more attractive to investors, who can transact in them more easily. They also allow investors to change the composition of their portfolio. Liquid markets permit financial institutions to accept larger asset-liability mismatches; they allow companies to have permanent access to capital and allow a central bank to use indirect monetary instruments and generally contribute to a more stable monetary transmission mechanism (Sarr & Lybek, 2012).

As a market becomes more liquid, it encourages more trading, which in turn, attracts more market participants, resulting in a virtuous circle where markets become more liquid and more efficient over time. A market that is characterized by high performance, efficiency and with minimal transaction costs and volatility is desirable in the growth process. Gwalani and Bharat (2013) observed that, liquid markets bring various benefits such as improved allocation of finance, stable monetary mechanism, and support to financial institutions in management of larger asset-liability mismatches.

1.1.3 Bond market in Kenya

The bond market in Kenya constitutes only a domestic market segment as distinct from a global market component. The domestic market constitutes government and corporate bond segments both of which have primary and secondary bond markets. As at end of March 2018, in terms of absolute value, the size of domestic bond markets in Kenya was approximately worth $16.45 billion (KES 1.645 Trillion) which was about 21.94% of the GDP, which stood at $ 74.94 Billion (CBK report, 2018; CMA Quarterly report 2018). Bond products in the Government bond market include fixed coupon rate bonds; zero coupon rate bonds; floating rate bonds; restructuring bonds; amortized and savings development bond; among others.

In the corporate market, the bonds are either secured or unsecured. Bonds in both markets range from one to thirty years. The Kenyan bond market is the third-largest in sub-Saharan Africa after those of South Africa and Nigeria, with a trading volume of $70m- $100m a day. However, from 2015 secondary trading has been slowing, largely due to changes in the economic environment and the lure of soaring interest rates for short-term debt instruments in the second half of the year.

1.2 Statement of the Problem

The financial sector in Kenya is dominated by banks. Despite their domination the banks have mismatches in the maturity of long-term investments as they are usually married with short-term liabilities. This limits the banks from large-scale financing of long-term investments. The bond market which has a high level of robustness mitigates the problems that come with the mismatch in the financial sector. According to Yoshitomi and Shirai (2011), the fragility of the sector is reduced and cheap long-term investment capital is provided by a robust bond market. Bond market development therefore remains a key policy issue in Kenya. The literature has identified certain factors and conditions as facilitators of faster development of bond markets (Fabella & Madhur, 2013).

A predictable and stable macro-economic environment lead to a robust bond markets in a country. According to Fabella and Madhur (2013), volatility in the macro-economic environment leads to overreliance on the government by the corporate bond market which creates slow growth of the market in a country. According to IMF (2012), robust government bond with a stable macroeconomic environment leads to rapid growth in the corporate bond market.

A study by Waweru (2014) sought to examine the effect of macroeconomic variables on the performance of infrastructure bonds. The findings suggested that interest rates and exchange rates have a positive relationship with performance of infrastructure bonds. The study despite focusing on macroeconomic factors was limited to infrastructure bonds. Mwangi (2013) studied the effect of benchmark bonds program on performance of the Kenyan government bond market. He concluded that the implementation of this program has an effect in fostering performance. The study was based on the benchmark program other than macroeconomic factors.

Noor (2017) did a study on the effect of macroeconomic factors on the performance of NSE. The study found that there was a negative relationship between performance of NSE and macroeconomic factors. This study focused generally on NSE other than specifically on bond market. Ndunda, Kingori and Ariemba (2015) did a study on the effect of macroeconomic factors on the performance of the equity market of NSE. A significant relationship was found between the factors and performance of equity market. The study focused on performance of equity market other than bond market. From the reviewed studies, there existed research gaps which this study sought to fill by determining the effect of macroeconomic factors on the performance of bond market in Kenya.

1.3 Objectives of the study

The main objective of the study was to determine the effect of macroeconomic factors on the performance of the bond market in Kenya. Specifically, the study sought:

i. To determine the effect of foreign exchange rate on bond market performance in Kenya
ii. To assess the effect of interest rate fluctuations on bond market performance in Kenya
iii. To investigate how inflation rate affects bond market performance in Kenya

1.4 Research Hypothesis

H_{o1} –Foreign exchange rate has no significant effect on bond market performance in Kenya

H_{o2} –Interest rate has no significant effect on bond market performance in Kenya

H_{o3} – Inflation rate has no significant effect on bond market performance in Kenya

1.5 Justification of the study

Bond markets in general and corporate bond markets in particular have been found to develop rapidly in countries where the macroeconomic environments have been more stable and predictable. Bond market development remains a key policy issue in Kenya in an error of a fragile macro-economic environment. There was need to identify macroeconomic factors and conditions as facilitators of faster development of bond markets.

1.6 Significance of the study

The study will add valuable contribution to the theory and practice. The study will add to the body of knowledge that exist and form a basis of further research by identifying the knowledge gap that arises from this study. Additionally, the study creates a platform for further analysis and debate on various macroeconomic variables and how they relate to the bond market performance. This shows that the study will be valuable to the scholars in their assignments and researchers for further research.

The study will be valuable to the policy makers. The macro-economic variables are a great importance to policy regulatory frameworks that are used to promote economic stability and growth. Policy formulation on the bond market for improved market performance will be guided by the recommendations of this study which will enhance bond performance in Kenya.

The findings will be of importance to the investors in the bond market. The ability to predict future trends in the bond market can be of great assistance to budding young Kenyan investors. This will enable them to know where and when to invest in the bonds market in Kenya. Both current and potential investors will understand the factors that would affect their investment and the performance of the bond market. This will enable them to make relevant investment decisions.

1.7 Scope of the study

The study sought to determine the effect of macroeconomic factors on the performance of the bond market in Kenya. The macroeconomic variables considered were: Foreign exchange, Interest rate and inflation rate. The study focused on the period between 2007 and 2017. This is due to the growth of the bond markets in Kenya and the fluctuations. The study was carried out between January to December 2018.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The literature relating to macroeconomic environment and bond market is reviewed in the study. The subsections include theoretical review, empirical review, conceptual framework and the research gap.

2.2 Theoretical Review

2.2.1 Market Segmentation Theory

Market segmentation theory was proposed by Tim Campbell in 1980. Market segmentation theory (MST) states there is no relationship between the markets for bonds with different maturity lengths and that interest rates affect the supply and demand of bonds. The theory postulates that the pattern of behavior of short-duration interest rate is totally not connected to the pattern of behavior of long-term interest rate. The theory argues that one cannot use short duration interest rates to predict with certainty future interest rates (Smithin, 2003).

Short-term interest rate and long duration interest rate must be analyzed independently. That means a variation in one is not a sign that the other will also vary immediately (Terrell & Frazer, 1976). Long term interest rate merely suggest market expectation does not necessarily figure out that accurate outcome will result. These choices lead to specific smaller market contingent upon market forces unique to each market. For instance, the market forces for short-term government and corporate bonds are influenced by companies need for short-term assets such as debtors and inventories (Smithin, 2003). While the market forces for medium and long-term maturity bonds depend on businesses financing intensive capital expenditure (Korkut, 2006). Borrowers and investors try to hedge at each maturity length, so that bond market segments operate independently of each other.

Market segmentation is also called segmented market theory (Korkut, 2006). It follows the assumption that the market for each section of bond maturities is mostly occupied by investors with a specific inclination in investing in securities with that maturity timeline (Terrell & Frazer, 1976). Segmented market theory also postulates that the buyers and sellers who are in the short-term bond market manifest diverse behavior and investment intentions than the majority of buyers

in and sellers in the medium- and long-term securities, therefore, they must not be deemed interchangeably (Smithin, 2003).

In his critique, Quiry et al. (2005) noted that bond investors have preferred maturity lengths. Investors will only look outside their preferred market if there is sufficient yield to compensate for the perceived additional risk or inconvenience of purchasing bonds with different maturity lengths. If the expected returns on longer-term bonds exceed the expectations for shorter-term bonds, investors who normally buy only short-term bonds will shift to longer maturities to realize increased returns. This theory helps in explaining why the prevailing macroeconomic variable parameters cannot be used to predict the future environment. It therefore helps investors in investing their resources without relying on the current market conditions.

2.2.2 Efficient Market Theory

This theory was put forward by Eugene Fama in 1970. 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 all 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).

Schwager (2012) disputed the efficient-market theory both empirically and theoretically. He attributes the imperfections in financial markets to a combination of cognitive biases such as overconfidence, overreaction, representative bias, information bias, and various other predictable human errors in reasoning and information processing. According to Dreman and Berry (1995), in low price earnings ratio (P/E) stocks have greater returns. They also refuted the fact that higher returns in low P/E stocks are attributed to higher beta.

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 will enable an average reader to understand the bond market and the factors that may affect the growth of the 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 tends 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 yields in Kenya. Kenyan 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 the 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.

2.2.3 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. 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 illiquid 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.

A critical analysis of Keynesian model with respect to this study does hint that an increase in government deficits consequently leads to an increase in 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.

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. 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 (Reilly & 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.

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 ask for a premium over and above the market rates. This discussion points to the fact 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 over others.

2.3 Empirical Review

This section reviewed relevant literature on studies on the macroeconomic factors and performance of the bond market. Azemi (2009) used data from the Malaysian companies to study the consequence that macroeconomic variables had on performance of firms' bonds for a period of twenty years spanning 1988 to 2008. This study compared the performance for two periods of ten years each to see if changes in macroeconomic variables affected bond prices. The dependent variable was bond price for firms while the independent variables comprised real output, money supply, price level and interest rate. The study applied the Error Correction Model in the analysis. The findings indicated that bond prices were co- integrated with the macroeconomic variables.

Zhou (2014) examined how the bond market reacted to changes in macroeconomic variables in China between the years 2000 to 2012. The variables comprised: real exchange rate, inflation, real interest rate, government debt, industrial production index and bond market index in Japan. The research applied a descriptive design using monthly time series data. The tests carried out include: Augmented Dickey Fuller test, unit root test, Philip Peron Test, Johansen co-integration test, Granger Causality Test and ECM (Error Correction Model). The findings show that all variables examined significantly impacted the performance of firms' bonds in the long term.

Tiryaki, Erdoğan and Ceylan (2017) conducted a study with the aim of establishing the causal connection among bond returns and changes in macroeconomic factors in Turkey between 2003 and 2016. The study applied Engle-Granger causality and ARDL tests to check the relationship in the Turkey market. The independent variables comprised: Industrial production index (IPI), Balance of Payment as measured by the current account balance to export, inflation as measured by CPI, exchange rates, interest rate, and the world oil price index. The study used monthly data obtained from financial statements of the firms and the central bureau for statistics. From the

findings, main determinants of bond returns included IPI, CPI, real effective exchange rate (RER), and current account to export ratio (CAEX).

Muinde (2017) applied the Johansen co-integration methodology to scrutinize the effect of macroeconomic variable changes in share prices at the NSE. The independent variables included: inflation, exchange rate, money supply, credit spread, lending rates, and Treasury bill rates. The study was informed by the letdown of the CAPM in predicting future yields with accuracy and the inconclusive debate that have followed it.

2.3.1 Foreign exchange rates

At bond market-level, Friberg and Nydahl (2013) examined exchange rate exposure of bond markets in eleven industrialized countries from 1983 to 2011. They used monthly effective trade-weighted exchange rate and ordinary least squares. They found positive exposure for most countries but which was insignificant in some countries. Also inclusion of world bond index increased the explanatory power of exchange rate exposure. Hondroyiannis (2011) examined foreign exchange rate influences on the bond market for Greece. They concluded that bond prices did not lead changes in real economic activity but that the macroeconomic activity and foreign bond market changes only partially influenced the Greek bond price movement.

Morales (2017) did an examination of the bond prices and exchange rate in Europe and America between 1999 and 2006. The study was based on seven countries including United Kingdom, Slovakia, United States of America, Czech Republic, Germany, Hungary and Poland. Daily data was used in the study. The analysis was done both in the short run and long run. The relationship between bond prices and exchange rate was done through Granger causality test, VECM, and Johansen co-integration. It was found that there was no relationship between bond prices and exchange rate except for Slovakia.

Stavarek (2014) determined the relationship between exchange rate and bond prices in 8 countries in Europe and United States from 1970 to 2003. This was based on the new and old countries in the Europe union. This involved Slocakia, Hungary,Czech Republic and Poland as the new countries; and United Kingdom, Austria, Germany and France as the old EU countries and United States of America. The study used Granger casualty test, co-integration and VECM to establish the relationship between the variables. A long run relationship was found between exchange rate

and bond prices between 1970 and 1992. Between 1993 and 2003, a strong relationship was established in the US and old members of European Union. This was due to a robust bond market and improved exchange rate. No long run relationship existed between the variables in the new members of the European Union due to an underdeveloped bond market and weak exchange rate. Johnson and Schuszter (2013) empirical findings are consistent with imperfect substitutability between Canadian and American dollar-denominated corporate bonds.

Ngabirano (2016) investigated the determinants of corporate bond performance in Kenya. A causal research design was applied to a population of 18 corporate issues listed on the Nairobi Securities Exchange (NSE). The study found that all the internal determinants had a negative insignificant relationship with bond performance except the bond issue size and the coupon which had a beta coefficient that was positive. The study also found that all the external determinants had a positive insignificant relationship with bond performance except the interest rates, exchange rates and inflation rates size which had a beta coefficient that was negative.

Nyamute (2015) did a study on financial variables and their relationship with bond prices in Kenya. The study was based on variables like exchange rate, interest rate, inflation rate and money supply with the major variable being exchange rate. The study was based on annual series data that was non-stationary in Kenya. VECM and Johansen procedure were used to analyze the relationship. Exchange rate and bond price displayed a positive relationship. The findings were in line with by those of Mwasaru and Sifunjo (2012) who used a period of 1993 and 1999 and based the study on monthly data. It was found that there was an effect of exchange rate on bond price in Kenya.

Ndunda (2016) studied the relationship between financial performance and macro-economic factors in firms in the listed equity firms in Kenya. The study was based on a 10-year period between 2004 and 2015. A descriptive research design was applied using average annual figure obtained from NSE, CBK, KNBS, and international Monetary Fund website. A multiple regression analysis was applied in estimating the extent to which dependent factor changes as outcome of a unit variation in each of the dependent variables. The result posted mixed findings as some variables showed positive and significant impact while others showed negative relationship.

2.3.2 Interest rates

Jalilv and Harris (2014) in a study of United States of America (USA) Corporation obtained results which suggested that interest rate conditions affected performance of the bond market in the USA. According to Singh (2013), if the interest rate in high investment falls, a low rate of interest leads to increase in investment activity. Increased investment may imply use of more debt. However, in the short run interest is inelastic and fails to influence the level of investment. Hence a relation exists between investment and use of debt and level of interest rates. The influence of macro-economic variables on volatility of the Kenyan bond was studies by Mwangi (2013). Interest rate was found to affect the bond volatility. The bond performance was found to be symmetric but no normal distribution.

Barr and Campbell, (2016) did a study on the relationship between bond market performance and macro-economic variables in the UK. The study was based on government index-linked and nominal bonds. The study found that there exist a negative relationship between interest rates and bond market performance in the short run. However, no relationship existed between bond performance and interest rate in the long run. 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.

2.3.3 Inflation rate

Gallagher and Taylor (2012) did a study on the relationship between bond returns and inflation rate. From the study, bond returns and inflation displayed a negative relationship. A similar study was done by Hondroyiannis and Papapetrou (2015) in Greece. The study found that inflation and bond market performance based on bond returns had a negative relationship. Wei (2017) did a study on bond returns and inflation in France between 1990 and 2016. The study used the vector error correction model to establish the relationship. The study established that there was a correlation between bond returns and inflation in France. It was found that a negative relationship existed between inflation and bond returns as measured by the market to book value.

Lee (2012) did a study on inflation and bond returns in the United States. The study found that there was a high bond price during high inflation periods. This shows that a positive relationship existed between inflation and bond market returns in the USA. Overpricing of bonds in the US was found to fuel inflation during the war period. In Bangladesh, Mohammad (2011) did a study on the effect of macro-economic variables and bond performance. The study was done from 2002-2009 and based on monthly data. The study used the OLS model and Granger causality test to establish the relationship between the variables. It was found that inflation and bond performance displayed a positive relationship.

Kim and Ravi (2016) sought to determine the effect of inflation rate on stock returns with macroeconomic variables moderating the effect. The study used OLS regression to analyze the relationship between the variables. The study found that inflation had a negative effect on stock returns. It was found that the sensitivity of the inflation rate was negatively related to the sensitivity of the bond market returns but positively related to bond return sensitivity. Laopodis (2015) examined the relationship between stock market, inflation and other macroeconomic variables. The study analyzed the data using causality, co-integration, VAR model, VEC model and VECM in order to establish the relationships. The study found a weak negative relationship between inflation and stock market returns with a causal relationship existing between inflation and stock market returns in the 1970s. However, in the 1990s a strong unidirectional relationship was found.

In Kenya, quarterly data was used by Kemboi and Taurus (2012) to examine the macroeconomic variables that affected the performance of the bond market. The data was collected for the period between 2000 and 2009. The relationship was analyzed using Johansen co-integration technique. The study found that inflation as a macroeconomic variable affected the performance of the Nairobi bond Market. However, the relationship was found to be insignificant.

2.4 Conceptual framework

The main focus of the study is to determine the effect of macroeconomic factors on the performance of the bond market in Kenya. The independent variables are the macroeconomic variables while performance of bond market in terms of total bond market size is the dependent variable. The relationship between the variables is conceptualized in figure 2.1.

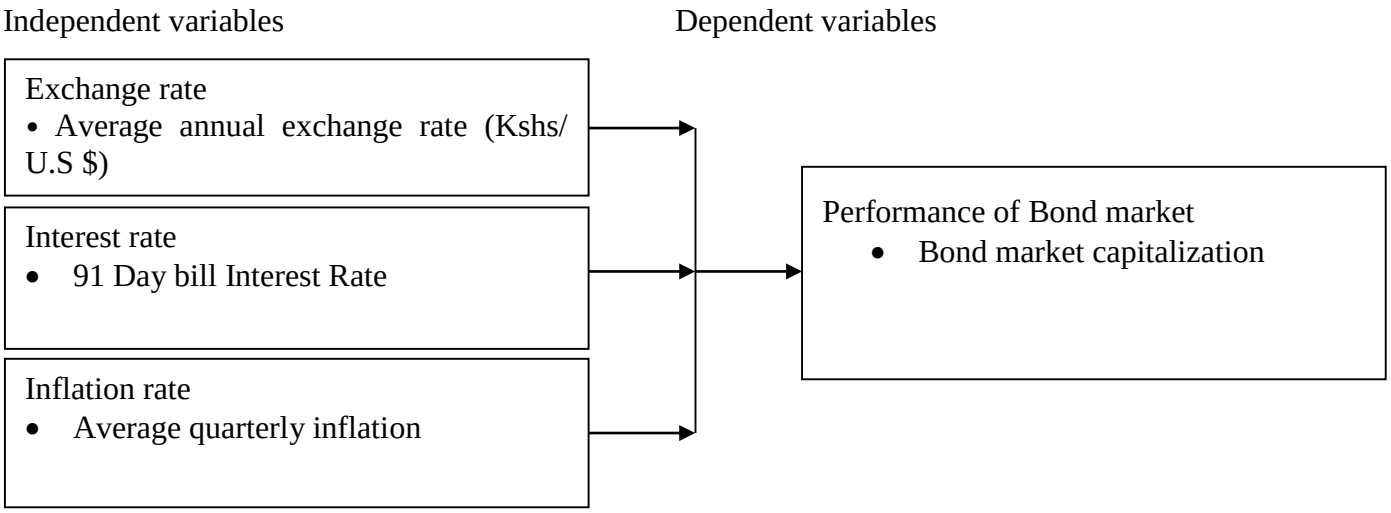

Figure 2.1: Conceptual framework

2.5 Operationalization of variables

	Measurement of variable	Formula
Independent		
Foreign Exchange rate	Average quarterly exchange rate (Kshs/US dollar)	Total annual exchange rates / Time (t*4)
Interest rate	91 Day bill Interest Rate	91 Day bill Interest Rate
Inflation rate	Average quarterly inflation	Total annual inflation rates / Time (t*4)
Dependent		
Bond market performance	Average quarterly bond market size	Total Bond market capitalization / Time (t*4)

2.6 Summary of literature review and Research Gaps

The study was based on the market segmentation theory, efficient market theory and the liquidity preference theory. The theories agree that macroeconomic variables of interest rate, exchange rate and inflation relate to performance of bond markets. The study has reviewed various empirical studies relating to macroeconomic variables and bond market performance. The literature was based on the objectives of the study. The empirical review presented studies across different countries that have used different estimation techniques, different time periods and different techniques of variable measurement which have generated different results.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This gives the methods that were adopted in the research. It gives the research design, target population, data collection, data analysis and the model specification.

3.2 Research Design

A research design is a scheme outline or plan that is used to generate answers to research problems (Orodho, 2003). It can also be defined as a general plan or strategy for conducting a research study to examine specific testable research questions of interest (Lavrakas, 2008). This study adopted a longitudinal research design. This is because it allows relationship between the variables to be assessed at intervals to assess their effects on bond market performance. In this study, data was collected to describe the relationship between macroeconomic factors and bond market. Since data was collected for a period of time, a time series study was conducted.

3.3 Target population

A population is an entire group of individuals, events, or objects having common characteristics that conform to desired specifications (Mugenda & Mugenda, 2003). The population in this study constituted the entire bond market in Kenya. The population of this study was drawn from quarterly bond market Index data for a period of 10 years from 2007 – 2017. This duration was justified for use because it is long enough and includes major events which influence bond prices such as political instability. The study was a census survey.

3.4 Data Collection

Secondary data was collected for the study. The researcher obtained quarterly data for the variables. For the purpose of the study, the secondary data was obtained from time series annual reports of the Central Bank, Capital Markets Authority (CMA), Nairobi Stock Exchange (NSE) and Kenya National Bureau of Statistics (KNBS). The study covered the period 2007– 2017.

3.5 Data Analysis

This study used descriptive and inferential statistics to analyze the data. This was based on mean, standard deviation, frequencies and percentages. Quarterly time series data was used. Multiple regressions were applied to analyze the data. This is a set of techniques for generating a predicted score for one variable, in this case the dependent variable, from four predictor variables, in this case independent variables. Time series data was collected over sequence of data points over a continuous time interval. The continuity in the data set allowed easy analysis of the behavior of the variables over the period. Data analysis was done using STATAv13. The data was presented in form of tables for ease of interpretation and presentation.

3.6 Model Specification

The study used a distributed lag model with lagged explanatory variables which included lagged values of dependent variables to test for the relationship between macroeconomic variables and bond market performance components. The model is called distributed lag model because the influence of the explanatory variable on the dependent variable is distributed over a number of past values of x.

For exchange rate the model would be;

$$BS_t=\beta o + \beta_1 ER_t+\beta_2 ER_{t-1} +\ldots+ \beta_q ER_{t-q} + \mu_t \quad (1)$$

Where BS_t is the Bond market size at time t

ER is Exchange rate

μ_t is the error term

q is the maximum lag

For interest rate the model would be;

$$BS_t=\beta o + \beta_1 IR_t+\beta_2 IR_{t-1} +\ldots+ \beta_q IR_{t-q} + \mu_t \quad (2)$$

Where BS_t is the Bond market size at time t

IR is Interest rate

$\mu_t$is the error term

$q$is the maximum lag

For inflation, the regression equation would be:

$BS_t=\beta o + \beta_1 IL_t+\beta_2 IL_{t-1}+\ldots+\beta_q IL_{t-q}+ \mu_t$ (3)

Where BS_t is the Bond market size at time t

IL is Inflation rate

$\mu_t$is the error term

$q$is the maximum lag

Lagged values of the variable are important explanatory variables in most economic relationships because economic behavior in any one period is also determined by pattern and behavior of previous values. The study used Likelihood Ratio (LR) test to select the appropriate lag length.

The overall regression model was as follows:

$BS_t =\beta o + \beta_1 ER_t+\beta_2 IR_t +\beta_3 IL_t$ (4)

Where;

BS_t = Average Annual Bond market size in year t

ERt = Exchange rate measured as average annual exchange rate in year t

IRt = Interest rate measured as average annual interest rate in year t

ILt = Inflation rate as measured as average annual inflation rate in year t

βo =Constant

β_1-β_3 = Regression coefficient of the independent variables.

3.6.1 Diagnostic Tests

Diagnostic tests were done to establish whether the model is significant. The test that were done included test for multicollinearity, normality and heteroskedasticity.

3.6.1.1 Test for Multicollinearity

Multicollinearity was checked for the model. Multicollinearity was tested to find out whether free factors are connected. Multicollinearity is usually a common problem where the researcher uses time series data. For this situation the investigation utilized the variance inflation factor (VIF) to build up whether multicollinearity exists. VIF values below 10 shows no worries regarding multicollinearity problems while VIF values above 10 show problems regarding multicollinearity.

3.6.1.2 Normality Testing

Normality test was done for the model. Normality testing incorporated checking for peculiarities in the data. It is assumed that data should be normally distributed in a linear regression. The error term shows the factors that should be considered in the study but had been assumed by the researcher in developing the model. In OLS there has to be a normal distribution of the error. The Shapiro–Wilk test was used to test for the normality.

3.6.1.3 Heteroscedasticity Test

Heteroscedasticity test was used to test whether the error term was the same across the observations. Heteroscedasticity is a problem in regression assumes that all residuals are drawn from a population that has a constant variance. The test was conducted using the white tests which established whether the variation amongst sampling units of a variable were continuous in a regression model. Where the p-value is more than 0.05 then heteroscedasticity is not a problem but if the p-value is less than 0.05 then there are problems relating to heteroscedasticity which should be rectified. The condition was corrected by applying corrected standard errors.

3.6.2 Test of Significance

ANOVA was used to test significance of the variables and model. Anova used F-statistics and p-value to test the fitness of the model to the data.

CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the findings based on the analyzed data. Specifically, it includes descriptive statistics, correlation analysis, co-integration, diagnostic tests, and modeling.

4.2 Descriptive statistics

Table 4.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Bond performance	44	9.970568	0.819902	7.955893	11.09827
Exchange rate	44	85.77861	11.98499	62.646	103.5177
Interest rate	44	9.534091	2.831299	6	18
Inflation rate	44	8.200379	3.719595	4.033333	16.83333

The descriptive statistics presented in table 4.1 show that the bond market had an average capitalization of 9.971 with the lowest bond capitalization being 7.9559 and 11.098 being the highest bond capitalization. The average exchange rate for the period under study was 85.77% with 62.646% being the lowest exchange rate and 103.518% being the highest exchange rate within the period.

The average interest rate was 9.534% with a minimum of 6% and a maximum of 18%. Inflation rate had an average of 8.20% over the period with a low of 4.033% and a high of 16.833%. The standard deviation shows that there is a high variability in the data especially in exchange rate. This shows that despite the macroeconomic variables varying within the period, exchange rate varied more compared to the other variables.

4.3 Correlation analysis

Table 4.2: Correlation analysis

	Bond Performance	Exchange rate	Interest rate	Inflation rate
Bond Performance	1.000			
Exchange rate	.6094**	1.000		
	.003			
Interest rate	-.1143*	.4187	1.000	
	.014	2.184		
Inflation rate	-.1948**	-.0861	-.2491	1.000
	.004	.962	.607	

Table 4.2 shows the results on correlation of the variables. The table shows that exchange rate and bond performance displayed a positive relationship as shown by correlation coefficient of 0.6094. The findings concur with those of Ngabirano (2016) who found that exchange rate had a negative effect on bond performance. Interest rate displays a negative relationship with bond performance as shown by coefficient of -0.1143. Inflation rate has a weak negative relationship with bond performance as shown by correlation coefficient of 0.1948. The factors are significant as the pvalues are less than 0.05.

4.4 Stationarity test

The data series were tested for stationarity using the Augmented Dicky Fuller (ADF).

Table 4.3: Unit root test

Variables	Dickey-Fuller test for unit root		Number of obs = 43
	t-statistic	Critical value (5%)	P-value
Bond Performance	-3.096	-3.528	0.1072
Exchange rate	-4.779	-3.528	0.0005
Interest rate	-3.944	-3.528	0.0105
Inflation rate	-4.102	-3.528	0.0063

From the results in table 4.4 show that the t-statistic value of bond performance is lower than the critical value, we cannot reject the null hypothesis. Hence, we conclude that the data series for bond performance is non-stationary. However, the t-statistics for exchange rate, interest rate and inflation rate were higher than the critical value at 5% is higher than the critical value, we reject the null hypothesis. Hence, we conclude that the data series for exchange rate, interest rate and inflation rate is stationary.

Table 4.4: Optimal lag length

Selection-order criteria

Sample: 2008q1 - 2017q4 Number of obs = 40

Lag	P	AIC	HQIC	SBIC
0		19.7059	19.7669	19.8747
1	0.000	17.4659	17.7712*	18.3103*
2	0.003	17.3681*	17.9176	18.8881

Note: *Indicates Significant

Table 4.3 shows the findings on the optimal lag length (Appendix III). The findings show that AIC has the lowest significant value at lag 2. This means that the optimal lag length is at lag 2. It has the smallest and significant value. AIC gives efficient estimates and is more superior to other methods. Lag 2 is chosen as the optimal lag. The number of observations is reduced to 40 as STATA provides for the lags which are 4. Hence 44-4=4

4.5 Co-integration

Johansen test was carried out to investigate whether there was more than a single co-integration relationship between macroeconomic variables and bond performance. The results of the Johansen tests of variables are reported in Table 4.5.

Table 4.5: Johansen tests for cointegration

Sample: 2007q3 - 2017q4 Number of obs = 42

Lags = 2

Maximum rank	Trace statistic	Critical value (5%)
0	53.7462	47.21
1	20.1649*	29.68

2	6.2441	15.41
3	1.0419	3.76

In the Johansen procedure, the likelihood ratio (LR) test is used to test the significance of estimates of Eigen values. The null hypothesis is that there is no co-integration in the data. If the trace statistics is higher than the critical value, we do not reject the null hypothesis. From table 4.5, the trace statistics and the maximum statistics values at lag 1 are less than the critical values hence we reject the null hypothesis that there is no cointegration in the model. Hence, we conclude that there is co-integration in the model. This meant that the variables are related and can be combined in a linear fashion. This also means that the variables have a long-run relationship, which could not necessarily hold in the short-run. Due to the existence of co-integration in the model we conducted the ARDL and the VECM model.

4.6 Auto Regression Distribution Lag

The ARDL model shows that there is a long-run relationship between macroeconomic variables (exchange rate, interest rate and inflation rate) and bond performance. This is shown by the p-value of 0.004 which is below 0.05 (Appendix II).

4.7 Vector Error Correction Model

After the Johansen cointegration test is performed, next is to fit the appropriate time series model. From Johansen and ARDL cointegration has been established between the variables. This implies that there exists a long run relationship between variables. The findings differ with those of Stavarek (2014) who found no long run relationship between exchange rate and bond performance. Hence, the VECM was applied in order to determine the short run relationships of cointegrated variables. The findings show that there is short run relationship in that the variables display p-values of less than 0.05 (Appendix III). The short run equation is:

BT= 4.0265-0.0806FXR-1.012TBR+0.3356IR

It was found that there is a negative relationship between exchange rate and bond performance in the short run. The findings differ with those of Morales (2017) who found that there was no short run relationship between bond prices and exchange rate. Interest rate displayed a negative relationship with bond performance in the short run. The findings differ with those of Singh (2013)

who found that there is a positive relationship between interest rate and bonds performance. Inflation had a positive relationship with bond performance in Kenya. The findings concur with those of Lee (2012) who found that a positive relationship existed between inflation and bond market performance. However, the findings differ with those of Wei (2017) found that a negative relationship existed between inflation and bond performance.

4.8 Diagnostic tests

Table 4.6: Multicollinearity

Variable	VIF	1/VIF
TBR	1.28	0.778927
IR	1.21	0.824302
FXR	1.07	0.937545
Mean VIF	1.19	

The VIF was used to establish whether there was multicollinearity in the data series. From table 4.7 the VIF values are close to 1 hence we conclude that multicollinearity is not a problem in the data.

Table 4.7: Normality test

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_BT	1.736	2	0.41975
D_IR	7.747	2	0.02079
D_TBR	15.539	2	0.00042
D_FXR	4.487	2	0.10609
ALL	29.509	8	0.00026

The normality of residual is tested using the Jarquebera test. The p-values for interest rate and inflation rate are less than the 0.05 level of significance suggesting the null hypothesis of normal distribution can be rejected. This means that the data series for interest rate and inflation rate is not normally distributed. However, this may not have serious implication because Jarque-Bera test statistics for bond performance and exchange rate had p-values greater than 0.05 suggesting that

the null hypothesis of normal distribution cannot be rejected. The study assumes that the data for bond performance and exchange rate is normally distributed. The findings are shown by table 4.8.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of BT

         chi2(1)      =     1.60
         Prob > chi2  =   0.2058
```

Figure 4.2: Heteroscedasticity

From the findings in figure 4.1 show that the p-value is more than 0.05. Hence, we cannot reject the null hypothesis that there is constant variance in our data. Hence the data is free from heteroscedasticity.

```
Number of obs =      44
F(  3,    40) =    9.01
Prob > F      =  0.0001
R-squared     =  0.4032
Adj R-squared =  0.3585
Root MSE      =  .65671
```

Figure 4.3: Significance test

F test was used to determine whether the model was significant. From figure 4.2, the F-calculated (9.01) is higher than the F-critical (2.8387) meaning that the model is significant and fits the data. This is supported by the p-value which is less than 0.05.

4.9 Model fitting

The ECM was represented by equations as fitted below:

Equation 1 was presented as follows;

$BS_t=\beta o + \beta_1 ER_t+\beta_2 ER_{t-1} +\ldots+ \beta_q ER_{t-q} + \mu_t$

The equation is fitted for the coefficients and ECT as:

$BS_t=2.3192 + 0.6362FR_t+ 0.0281FR_{t-1}-0.0087FR_{t-2}$

Holding the exchange rate constant within the two years, the bond trading would be at 2.3192. A unit change in exchange rate would lead to increase in bond performance by 0.6362 within the period and 0.0281 in the first-year decrease bond performance by 0.0087 in the second year.
The second equation was presented as:

For interest rate the model was;

$BS_t=\beta o + \beta_1 IR_t+\beta_2 IR_{t-1} +\ldots+ \beta_q IR_{t-q} + \mu_t$ (2)

The fitted equation was:

$BS_t=2.4337 + 0.7632IR_t-0.0300IR_{t-1} + 0.0533IR_{t-2}$

Holding interest rate constant within the first two years, the bond performance would be at 2.4337. A unit change in interest rate would lead to increase in bond performance by an average of 0.7632. However, interest rate would decrease bond performance by 0.03 in the first year but increase bond performance by 0.0533 in the second year.

For inflation, the regression equation was:

$BS_t=\beta o + \beta_1 IL_t+\beta_2 IL_{t-1}+\ldots+\beta_q IL_{t-q}+ \mu_t$

The model was fitted as:

$BS_t=1.4297+ 0.8224IL_t+0.0522IL_{t-1}-0.0449IL_{t-2}+ \mu_t$ (3)

Holding inflation rate constant within the first two years, the bond performance would be at 1.4297. A unit change in inflation rate would lead to increase in bond performance by an average of 0.8224. and by 0.0522 in the first year. However, inflation rate would decrease bond performance by 0.0449 in the second year.

Overall output model was:

$BS_t=\beta o + \beta_1 ER_t+\beta_2 IR_t +IL_t$

The model was fitted as:

$BS_t=2.2806 + 0.0306ER_t -0.0099IR_t +0.0311IL_t$

From the overall model, the equation shows that holding exchange rate, interest rate and inflation rate constant within the first two years, the bond performance would stand at 2.2806. If exchange rate changes by one percent, bond performance increase by 3.05% within the period. A percentage increase in interest rate would decrease bond performance by 0.99% while a percentage increase in inflation rate would increase bond performance by 3.11%.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusions and recommendations based on the objectives of the study.

5.2 Summary

The bond market in Kenya plays a pivotal role in fostering economic development in the country through offering investment opportunities to both local and foreign investors and also financing the government budget deficit. Factors that typically influence the bond market vary and include a range of macro-level, industry level, market level and firm level factors. A predictable and stable macro-economic environment lead to a robust bond markets in a country. Given this assertion, an explanation of this requires studying the macroeconomic factors and their effect on the bond performance in Kenya. The specific objectives of the study were: to determine the effect of foreign exchange rate on bond market performance in Kenya; to assess the effect of interest rate fluctuations on bond market performance in Kenya; and to investigate how inflation rate affects bond market performance in Kenya.

Stationary tests for the variables showed that there was stationarity in the data series except for bond performance. The long run regression results showed that the effect of macroeconomic factors on bond performance existed. The VECM findings showed that there was a short run relationship between the macroeconomic factors and bond performance. There was a negative effect of exchange rate and interest rate on bond performance. However, inflation rate displayed a positive relationship with bond performance in the short run.

5.2.1 Exchange rate

The first objective of the study was to determine the effect of foreign exchange rate on bond market performance in Kenya. The ARDL results show that there existed a long-run relationship between exchange rate and bond performance. The long run relationship is positive for exchange rate and bond performance. The exchange rate displays a negative effect on bond performance in the short

run. From the regression analysis exchange rate displays an average positive effect on bond performance that turns negative in the second year.

5.2.2 Interest rate

The second objective was to assess the effect of interest rate fluctuations on bond market performance in Kenya. The results showed that interest rate had a significant positive effect on the bond performance in long run. The VECM model shows that there exists a negative short run relationship between interest rate and bond performance. The regression model shows that interest rate has a negative relationship with bond performance. However, the relationship is negative in the first year but turns positive in the second year.

5.2.3 Inflation rate

The third objective was to investigate how inflation rate affects bond market performance in Kenya. The results showed that inflation rate had a significant positive effect on the bond performance in long run. The VECM model showed that there existed a positive short run relationship between interest rate and bond performance. The regression model shows that inflation rate had a positive relationship with bond performance in average. The relationship is positive in the first year but turns negative in the second year.

5.3 Conclusions

On the basis of the empirical results, the study concludes that there is a long run relationship between macroeconomic variables (exchange rate, interest rate and inflation rate) and bond performance in Kenya. In the short run exchange rate and interest rate has negative effect on bond performance in Kenya. However, inflation rate has a negative effect on bond performance in Kenya. There is a short run effect of macroeconomic factors on bond performance which is important in explaining changes in bond market performance in Kenya. Based on the regression analysis the study concludes that exchange rate and inflation rate have a positive effect on bond performance in Kenya. However, interest rate has a negative effect on bond performance in Kenya.

5.4 Recommendations

The study findings show that exchange rate changes increase in bond performance. The stability of the Kenyan shilling against key currencies like USD is critical in containing bond performance. Policy interventions should be put in place to ensure a stable Kenyan shilling against the dollar.

The study found that interest rates contribute significantly to bond market performance. In particular, an increase in the interest rates leads to a decrease in bond performance in Kenya. This study recommends that policies on interest rate controls be observed closely to contain increase in interest rate which is found to contribute to bond performance.

Inflation is found to be a key contributing factor to bond performance in Kenya since an increase in inflation leads to a significant increase in bond performance. This informs government monetary policy that stock market volatility can be significantly reduced if the rate of inflation in the country is controlled. In light of this finding, the study recommends a strict monetary policy and control of factors contributing to change in inflation rate in order to enhance bond performance.

5.5 Recommendations for future research

This study recommends further studies to be done using other macro-economic variables to understand their contribution to bond performance in Kenya.

5.6 Limitations of the study

The study was limited to macroeconomic factors and the performance of the bond market in Kenya. The study was limited to the 10-year period from 2007 to 2017. This means that the findings may differ with others done over a different period. The precision of the data also limited the study. This is because it was hard to confirm the credibility of the data available.

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Appendices

Appendix I: Data collection sheet

	Bond capitalization	Foreign exchange rate (Ksh/USD)	Interest rate (%)	Inflation rate (%)
Quarter 1				
Quarter 2				
Quarter 3				
Quarter 4				

Appendix II: Data

Year	Quarter	Bond Capitalization (Kshs. Millions)	Foreign exchange rate (Ksh/USD)	Interest rate (%)	Inflation rate (%)
2007	Q1	3945.517	69.598	10.000	5.540
	Q2	9576.867	67.448	10.000	4.540
	Q3	9805.133	67.013	10.000	4.580
	Q4	4717.767	65.213	10.000	4.400
2008	Q1	7446.617	67.876	11.500	5.380
	Q2	2852.333	62.646	10.500	8.627
	Q3	7099.830	68.597	10.000	11.923
	Q4	3672.150	77.624	10.000	15.217
2009	Q1	6986.400	79.581	8.500	16.833
	Q2	8703.373	78.446	10.000	15.920
	Q3	8118.067	76.243	11.500	13.393
	Q4	12142.617	75.138	11.500	10.300
2010	Q1	39129.733	76.488	8.500	7.850
	Q2	50829.250	78.938	7.500	5.867
	Q3	38582.617	80.926	8.500	4.707
	Q4	26814.350	80.581	8.500	4.033
2011	Q1	34599.950	82.236	9.500	4.157
	Q2	40592.750	86.124	8.500	6.013
	Q3	38943.950	93.014	8.500	9.020
	Q4	28425.533	93.870	8.500	12.777
2012	Q1	28689.767	84.139	18.000	15.827
	Q2	34031.003	84.120	18.000	16.290
	Q3	66057.017	84.276	13.000	14.297
	Q4	45518.950	85.578	11.000	10.697
2013	Q1	19907.300	86.721	6.000	7.257

	Q2	63929.283	84.608	6.250	5.043
	Q3	29399.417	87.255	11.000	4.563
	Q4	34230.367	85.907	18.000	5.387
2014	Q1	33095.783	86.327	6.750	6.203
	Q2	37486.667	87.247	6.000	6.827
	Q3	32078.300	88.238	6.000	7.237
	Q4	40701.783	89.878	6.000	6.977
2015	Q1	40215.183	91.525	8.250	6.667
	Q2	19295.128	95.844	7.750	6.657
	Q3	15380.483	102.967	7.750	6.390
	Q4	23215.807	102.381	7.000	6.437
2016	Q1	35699.757	101.910	8.750	6.840
	Q2	47034.277	101.035	9.000	6.590
	Q3	19432.639	101.338	9.000	6.470
	Q4	29438.583	101.734	8.500	6.403
2017	Q1	31166.419	103.404	10.000	6.483
	Q2	42270.046	103.359	8.500	7.723
	Q3	33074.221	103.518	8.750	8.323
	Q4	25678.425	103.351	8.750	8.153

Appendix III: Output

Lag length selection criteria

```
. varsoc BT IR TBR FXR

   Selection-order criteria
   Sample:  2008q1 - 2017q4                  Number of obs      =        40
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-390.117				4248.77	19.7059	19.7669	19.8747
1	-329.318	121.6	16	0.000	454.704	17.4659	17.7712*	18.3103*
2	-311.361	35.913*	16	0.003	423.217*	17.3681*	17.9176	18.8881
3	-299.325	24.072	16	0.088	551.459	17.5663	18.3601	19.7618
4	-291.685	15.28	16	0.504	956.208	17.9843	19.0224	20.8554

```
   Endogenous:  BT IR TBR FXR
    Exogenous:  _cons
```

Unit Root test

```
. reg BT IR
```

Source	SS	df	MS	Number of obs =	44
				F(1, 42) =	1.66
Model	1.09684661	1	1.09684661	Prob > F =	0.2051
Residual	27.8094568	42	.662129923	R-squared =	0.0379
				Adj R-squared =	0.0150
Total	28.9063034	43	.672239614	Root MSE =	.81371

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
IR	-.0429381	.0333612	-1.29	0.205	-.1102638	.0243875
_cons	10.32268	.299819	34.43	0.000	9.717617	10.92774

```
Durbin-Watson d-statistic(  2,    44) =  .4574617

. reg BT FXR
```

Source	SS	df	MS	Number of obs =	44
				F(1, 42) =	24.81
Model	10.734874	1	10.734874	Prob > F =	0.0000
Residual	18.1714294	42	.43265308	R-squared =	0.3714
				Adj R-squared =	0.3564
Total	28.9063034	43	.672239614	Root MSE =	.65776

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
FXR	.0416895	.0083695	4.98	0.000	.0247992	.0585797
_cons	6.394502	.7247373	8.82	0.000	4.931923	7.857081

```
. estat dwatson

Durbin-Watson d-statistic(  2,    44) =  .3980961

. reg BT TBR
```

Source	SS	df	MS	Number of obs =	44
				F(1, 42) =	0.56
Model	.377957042	1	.377957042	Prob > F =	0.4599
Residual	28.5283464	42	.679246342	R-squared =	0.0131
				Adj R-squared =	-0.0104
Total	28.9063034	43	.672239614	Root MSE =	.82416

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
TBR	-.0331132	.0443909	-0.75	0.460	-.1226976	.0564712
_cons	10.28627	.4410875	23.32	0.000	9.396121	11.17642

Regression

```
. regress BT IR TBR FXR
```

Source	SS	df	MS	Number of obs =	44
				F(3, 40) =	9.01
Model	11.6555738	3	3.88519127	Prob > F =	0.0001
Residual	17.2507296	40	.43126824	R-squared =	0.4032
				Adj R-squared =	0.3585
Total	28.9063034	43	.672239614	Root MSE =	.65671

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
IR	-.0423	.0296552	-1.43	0.162	-.1022354	.0176354
TBR	.0351035	.0400779	0.88	0.386	-.045897	.116104
FXR	.0426247	.0086299	4.94	0.000	.0251831	.0600664
_cons	6.326472	.9012076	7.02	0.000	4.505063	8.14788

VECM

```
Vector error-correction model

Sample:  2007q3 - 2017q4                        No. of obs      =         42
                                                AIC             =   17.46309
Log likelihood =  -339.725                      HQIC            =   17.87255
Det(Sigma_ml)  =  124.6951                      SBIC            =   18.58017

Equation           Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
D_BT                   6     .490656   0.2610   12.71653   0.0478
D_IR                   6     3.71307   0.2351   11.06507   0.0864
D_TBR                  6     2.07568   0.5766   49.02181   0.0000
D_FXR                  6     5.33507   0.1165   4.747171   0.5766
------------------------------------------------------------------
```

```
. regress BT L.BT L.FXR FXR L.TBR L.IR
```

Source	SS	df	MS		
Model	17.6722662	5	3.53445324	Number of obs =	43
Residual	8.31071229	37	.224613846	F(5, 37) =	15.74
				Prob > F =	0.0000
				R-squared =	0.6801
				Adj R-squared =	0.6369
Total	25.9829785	42	.618642345	Root MSE =	.47393

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
BT						
L1.	.6373687	.1180194	5.40	0.000	.3982386	.8764987
FXR						
L1.	.0305839	.0149656	2.04	0.048	.0002606	.0609072
--.	-.0161785	.01516	-1.07	0.293	-.0468956	.0145387
TBR						
L1.	-.0099808	.0292123	-0.34	0.735	-.0691705	.0492089
IR						
L1.	.0311244	.0223365	1.39	0.172	-.0141336	.0763825
_cons	2.280642	.9718741	2.35	0.024	.3114377	4.249846

```
. reg BT L.BT L(1/3)FXR
```

Source	SS	df	MS	Number of obs =	41
				F(4, 36) =	15.96
Model	15.6888168	4	3.92220421	Prob > F =	0.0000
Residual	8.84541893	36	.245706081	R-squared =	0.6395
				Adj R-squared =	0.5994
Total	24.5342358	40	.613355894	Root MSE =	.49569

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
BT						
L1.	.6361507	.131973	4.82	0.000	.3684972	.9038043
FXR						
L1.	.028068	.015686	1.79	0.082	-.0037447	.0598808
L2.	-.0087194	.018865	-0.46	0.647	-.0469794	.0295405
L3.	-.0038199	.0158925	-0.24	0.811	-.0360513	.0284116
_cons	2.31921	1.008304	2.30	0.027	.2742756	4.364145

```
. reg BT L.BT L(1/3)TBR
```

Source	SS	df	MS	Number of obs =	41
				F(4, 36) =	13.89
Model	14.8897574	4	3.72243935	Prob > F =	0.0000
Residual	9.64447838	36	.267902177	R-squared =	0.6069
				Adj R-squared =	0.5632
Total	24.5342358	40	.613355894	Root MSE =	.51759

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
BT						
L1.	.7632447	.1038641	7.35	0.000	.5525986	.9738909
TBR						
L1.	-.0300424	.033806	-0.89	0.380	-.0986042	.0385195
L2.	.0533299	.038225	1.40	0.172	-.0241939	.1308538
L3.	-.0270352	.0338677	-0.80	0.430	-.0957221	.0416518
_cons	2.433753	1.138686	2.14	0.039	.1243912	4.743114

```
. reg BT L.BT L(1/3)IR
```

Source	SS	df	MS	Number of obs	=	41
				F(4, 36)	=	17.41
Model	16.1738471	4	4.04346178	Prob > F	=	0.0000
Residual	8.36038865	36	.232233018	R-squared	=	0.6592
				Adj R-squared	=	0.6214
Total	24.5342358	40	.613355894	Root MSE	=	.48191

BT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
BT						
L1.	.8224342	.100542	8.18	0.000	.6185255	1.026343
IR						
L1.	.0522338	.0235216	2.22	0.033	.0045298	.0999378
L2.	-.0449853	.0245553	-1.83	0.075	-.0947859	.0048152
L3.	.0377639	.022143	1.71	0.097	-.0071441	.0826719
_cons	1.42968	1.070714	1.34	0.190	-.7418285	3.601189

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_BT						
_ce1						
L1.	-.0313279	.0375766	-0.83	0.404	-.1049766	.0423209
BT						
LD.	-.2757703	.1531166	-1.80	0.072	-.5758736	.024333
IR						
LD.	.0369362	.0237039	1.56	0.119	-.0095225	.0833949
TBR						
LD.	-.0430224	.0320649	-1.37	0.172	-.1066683	.0190236
FXR						
LD.	.0041206	.0174161	0.24	0.813	-.0300144	.0382556
_cons	.0373141	.077715	0.48	0.631	-.1150046	.1896327
D_IR						
_ce1						
L1.	.0235784	.2843629	0.08	0.934	-.5337627	.5809195
BT						
LD.	-1.937724	1.156719	-1.67	0.094	-4.208773	.3333239
IR						
LD.	-.179782	.1793803	-1.00	0.316	-.5313609	.171797
TBR						
LD.	.1246773	.2426526	0.51	0.607	-.350913	.6002675
FXR						
LD.	-.2690295	.1317976	-2.19	0.028	-.5473461	-.0307109
_cons	.4265603	.5001127	0.73	0.460	-.7261113	1.579232
D_TBR						
_ce1						
L1.	.9845351	.1589648	6.19	0.000	.6729698	1.2961
BT						
LD.	-1.949243	.6477483	-3.01	0.003	-3.218807	-.6796802
IR						
LD.	.0679094	.1002773	0.68	0.498	-.1285505	.2643694
TBR						
LD.	.4467208	.1356478	3.29	0.001	.1808559	.7125856
FXR						
LD.	-.1061853	.0736776	-1.44	0.150	-.2505907	.0382202
_cons	-.0725861	.3267672	-0.22	0.825	-.716958	.5717856
D_FXR						
_ce1						
L1.	.0571254	.4005829	0.14	0.889	-.7436824	.8579332
BT						
LD.	.3346981	1.66469	0.20	0.841	-2.928426	3.597822
IR						
LD.	.1368385	.2577401	0.53	0.595	-.3683228	.6419998
TBR						
LD.	-.0327559	.3466519	-0.09	0.925	-.7161041	.6505863
FXR						
LD.	-.3353959	.1693716	-1.77	0.077	-.7065573	.0357655
_cons	1.095393	.8450214	1.30	0.195	-.5608186	2.751605

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	3	45.48113	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
BT	1	.	.	.	.	.
IR	.3355507	.1162203	2.84	0.005	.1077432	.5633581
TBR	-1.012055	.1551103	-6.52	0.000	-1.316065	-.708044
FXR	-.080588	.0282954	-2.85	0.004	-.136043	-.0251269
_cons	4.026506	.	.	.	.	.

FXR						
BT						
L1.	1.522531	1.656194	0.92	0.358	-1.723549	4.768611
L2.	-.1689323	1.550425	-0.11	0.913	-3.20771	2.869845
FXR						
L1.	.6399885	.1732904	3.69	0.000	.3003456	.9796315
L2.	.2020948	.1749537	1.16	0.248	-.1408081	.5449977
TBR						
L1.	.0288589	.3144966	0.09	0.927	-.587543	.6452609
L2.	.0567859	.3043568	0.19	0.852	-.5397424	.6533143
IR						
L1.	-.0731099	.2690496	-0.27	0.786	-.6004375	.4542176
L2.	-.3531961	.2564059	-1.38	0.168	-.8557425	.1493503
_cons	3.696839	10.61173	0.35	0.728	-17.10177	24.49545
TBR						
BT						
L1.	-1.065246	.6842386	-1.56	0.120	-2.406329	.2758366
L2.	1.834794	.6405415	2.86	0.004	.5793557	3.090232
FXR						
L1.	-.1775667	.0715931	-2.48	0.013	-.3178865	-.0372469
L2.	.1133132	.0722802	1.57	0.117	-.0283534	.2549799

	TBR					
	L1.	.447554	.1299309	3.44	0.001	.1928942	.7022139
	L2.	-.446061	.1257417	-3.55	0.000	-.6925103	-.1996117
	IR					
	L1.	.3832535	.1111549	3.45	0.001	.1653938	.6011132
	L2.	-.0768383	.1059314	-0.73	0.468	-.2844599	.1307833
	_cons	4.966762	4.384122	1.13	0.257	-3.625959	13.55948
IR							
	BT					
	L1.	-1.348822	1.051602	-1.28	0.200	-3.409924	.7122809
	L2.	1.393375	.9844444	1.42	0.157	-.5361009	3.32285
	FXR					
	L1.	-.2602949	.1100309	-2.37	0.018	-.4759516	-.0446382
	L2.	.19733	.111087	1.78	0.076	-.0203967	.4150566
	TBR					
	L1.	.20802	.19969	1.04	0.298	-.1833652	.5994052
	L2.	-.0940318	.1932517	-0.49	0.627	-.4727982	.2847345
	IR					
	L1.	.4968512	.1708334	2.91	0.004	.1620239	.8316784
	L2.	-.1024566	.1628053	-0.63	0.529	-.4215491	.2166358
	_cons	9.181728	6.737931	1.36	0.173	-4.024373	22.38783