

**EFFECT OF MACROECONOMIC VARIABLES ON SHARE PRICE INDEX
VOLATILITY AT THE NAIROBI SECURITIES EXCHANGE**

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF
MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS,
UNIVERSITY OF NAIROBI**

2019

DECLARATION

I hereby declare that this research project is my original work; it has not been presented to any other institution of higher learning for academic purposes.

Signed Date

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D61/81730/2015

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

Signed Date

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DEDICATION

This project is dedicated to all my family members for the support and encouragement they gave me during the research period. Special dedication goes to my son Ryan Kamau.

ACKNOWLEDGMENT

I am thankful to God for giving me good health and strength to complete my coursework and to finish this project. Special thanks to my supervisor Dr. Duncan Elly Ochieng for his intellectual support and for the significant role he played in guiding me throughout my research work.

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ABBREVIATIONS AND ACRONYMS

AKI:	Association of Kenya Insurers
ANOVA:	Analysis of Variance
APT:	Arbitrage Pricing Theory
CAPM:	Capital Asset Pricing Model
CMA:	Capital Markets Authority
EPS:	Earnings per Share
GDP:	Gross Domestic Product
IJK:	Insurance Institute of Kenya
ISE:	International Securities Exchange
KNBS:	Kenya National Bureau of Statistics
MFI:	Microfinance Institutions in Kenya
MIPs:	Medical Insurance Providers
MPT:	Modern Portfolio Theory
NSE:	Nairobi Securities Exchange
ROA:	Return on Assets
SPSS:	Statistical Package for Social Sciences

ABSTRACT

An understanding of the dynamic behavior of stock markets is as such important for policy makers, macroeconomists, and market analysts. Investments are guided by the perceived risk profile, which is subject to macroeconomic variables. Therefore, this study sought to establish the influence of macroeconomic variables changes in Nairobi securities exchange index volatility. The study utilized a descriptive research design. Secondary data was acquired from the financial reports of respective firms while data on the securities and their movement were acquired from the Nairobi Securities Exchange. Information on exchange rates and interest rates over the period of interest was acquired from the Central Bank of Kenya while information on inflation trends was acquired from the Kenya Bureau of Statistics. Descriptive statistics was utilized to explain quantitatively the significant attributes of the variables using mean, frequency and standard deviation while multiple regression was utilized to describe the effects of macroeconomic variables changes in Nairobi securities exchange index volatility. Findings from this study showed that a unit increase in interest rate while holding all the other factors constant would lead to a decrease of volatility index at NSE. Results also showed a negative association between inflation rate and volatility index of Nairobi Securities Exchange. Further, exchange rate had a negative influence on volatility index at Nairobi Securities Exchange. However, from the regression predictions, it was noted that GDP growth had a positive influence on volatility index at Nairobi Securities Exchange. The study recommended Central Bank of Kenya to come up with an effective policy on interest rates to ensure that their rise and fall does not adversely impact the Kenyan economy. Study recommended the government to ensure a stable economy and institute policies to ensure that the economy is growing to enhance the volatility index. It also recommended the monetary committee department of central bank of Kenya to maintain a stable foreign currency exchange if the activities at the stock exchange are to be promoted. Additional study can be carried using other variables like political stability, balance of payments, taxation among other variables. For the managers of firms listed at NSE, the findings of this study provide valuable information to guide their management decision following the changes in the macroeconomic variables in Kenya in their endeavor to maximize the stakeholder's wealth. The capital markets regulatory authorities use the information to advise the Government on policymaking and areas local market may be seeking Foreign Direct Investments.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The stock market has an important role to play in a market economy because it aids a company to have access to capital, and the primary investors a chance to own part of the company, and for the secondary investors an opportunity to gain from it based on its future performance (Bhattacharyay, 2013). Macroeconomic variables are variables controlling the macro-economy, which is the whole economy (Olukayode & Akinwande, 2013). Macroeconomic variables include economic growth represented by interest rates, gross domestic product (GDP), inflation rates, and exchange rates (Achillah, 2011). According to Bhattacharyay (2013), investments, which lead to promotion of economic growth and improvement, need long-standing funding that most savers are unwilling to offer.

The study is anchored on modern portfolio theory, arbitrage pricing theory and Capital Asset Pricing Model. Modern portfolio theory enables investors to examine their expected returns primarily based on the predisposed risks. This theory seeks to make the most of the investors return on the portfolio and to lessen the portfolio risk at any level of expected return of a portfolio (Markowitz, 1952). On the other hand, arbitrage pricing theory helps in determining asset values using the law of one price and taking no arbitrage. APT argues, asset prices are affected by numerous macro-economic variables. Pavola (2011) noted that APT is a brand new and exceptional model that helps in asset prices determination.

A financial role is played significantly by the Nairobi securities exchange as it provides access for company's capital and liquidity through helping them in raising equity capital and ensuring that a secondary market platform is created for the companies to be able to trade in listed securities. The financial sector is being developed greatly by the Nairobi securities exchange so that efficiency in the stock markets can be improved and thereby economic performance (Amata, 2017). Undue unpredictability in the markets creates challenges in the effective performance of the capital markets. This study sought to establish how these macroeconomic variables influence the stock market volatility of firms listed in Nairobi securities exchange.

1.1.1 Macroeconomic Variables Changes

According to Romer (2012), macroeconomics is centered on the behavior of an economy in totality nationally, either regionally or internationally. Macroeconomic factors are referred to as variables. These variables include economic output, interest rates, population size, the government financial and budget balances as well as those of international trade and productivity. Pal and Mittal (2011) advance that key macroeconomic variables affecting investment markets are; inflation, exchange rates, fiscal deficits, interest rates and economic growth.

Interest rates are one of the central macroeconomic factors influencing the economy. In any economy, the indication of a tight monetary policy can be seen because of a high interest rate (Yang, 2014). Periods in an economy that are marked with high interest rates mean that business find it a more difficult task to borrow money, therefore making it

an unattractive time to invest. Individuals too are adversely impacted by the escalation in interest rates because the cost of repaying both their loans and mortgages also cost more.

On the other hand, inflation rates are also a part of the determinants of performance of firms. When the general price levels of services and goods in the economy increases, the general term used is inflation (Tucker, 2014). An increase in price of any specific product cannot be considered as inflation, and only when there is increase in the overall average level of prices can the term be applied.

1.1.2 Security Index Volatility

Ambrosio (2015) defined security index volatility as the varying of broad stock market index prices within a defined period. Security index volatility can be viewed as the standard deviation of a stock market index's returns. It is the nature of investors to be risk averse, and as such they consider it to be important to monitor the fluctuations in the value of their investments as it portrays to them how much they are exposed to any level of risk.

The volatility of the common stock is therefore, a benchmark for how they measure risk because it offers an indication of how the stock changes pace regarding its price over a set period (Pal & Mittal, 2011). High volatility points at two possibilities, which is there is either a likelihood to make a gain or loss in the short-term. It can therefore postulate that the prices of volatile stocks vary greatly over time and it would be difficult to accurately predict the security future prices. Thus, less risky investments are more preferable to investors compared to those with a higher risk (Kinder, 2012).

Elements in finances, politics and economy are diverted by stock markets adjustments. Market price fluctuations are determined by factors such as; the corporation's techniques and its earnings, their profitability, their level of enterprise approach, their political balance and interest fees, these factors affect markets in one way or another (Kuranguri, 2016). Stock market volatility is associated with commercial enterprise cycle, recessions, booms or recovery times. Stock market volatility could be moderate during recessions and depressions but high during booms and recovery (Yang, 2014).

1.1.3 Macro Economic Variables and Security Index Volatility

According to Acikalin (2011), financial markets have over the years evolved around the issue of volatility of stock markets because of the significant risks it poses, which could lead to deterioration of the financial system. Volatility is affected by different factors that include expectations and news; that influence adjustments to be made to stock markets. A collapse of stock market would be such severe as to send an economy into the dip because of the detrimental consequences it would cause to economic growth, employment, and poverty levels. Therefore, if forces that influence volatility are explored and defined further, the result would be more efficient strategies in managing macro-economic factors in the economy.

The economic development of a country exhibited through a well-functioning stock market is enhanced in two significant ways, which are enhancing savings and providing a better way of allocation of resources (Junkin, 2012). Companies also benefit from efficient stock markets as they are able to access capital easily and efficiently due to improved business environment around which the transactions happen. A study by Yang

and Doong (2014) posits that a flow-oriented approach explains imbalances between the forces of demand and supply of funds regarding exchange rates. A country's ability to trade internationally and its competitive position are affected by the imbalances, which consequently influences its real income and the output produced.

1.1.4 Nairobi Securities Exchange

The Nairobi securities exchange was formed in 1954 as a voluntary association of stockbrokers in the European community registered under Kenya's Societies Act. Currently the Nairobi Securities Exchange (NSE) comprises of 65 firms as at 30th April 2017. The market players in the Nairobi Security Exchange include Investment banks, stockbrokers, investors and regulatory authorities (NSE, 2012).

The 65 listed firms are classified into eleven sectors which include; Agricultural, Technology and Telecommunication, Commercial and Services, Investment Services (NSE Shares), Banking, Investment, Insurance, Automobiles and Accessories, Construction and Allied, Manufacturing and Allied, Energy and Petroleum. An additional sector, Growth Enterprise Market Segment, was introduced in 2013 (Ongore, 2013).

The research will measure the volatility using Nairobi Securities Exchange All Share Index (NASI) which was introduced as an alternative index to cover all listed companies on the Nairobi Securities Exchange. Its measure is an overall indicator of market performance. The Index incorporates all the traded shares of the day to give the overall market.

1.2 Research Problem

The undue unpredictability of stock prices often poses a challenge in the efficient performance of the financial markets and eventually negatively affects the market. The volatility may cause investors to make alternate investing decisions where they would consider moving their assets to risk-free investments rather than investing in riskier investments (Habibullah & Baharumshah, 2014). An understanding of the dynamic behavior of stock markets is as such important for policy makers, macroeconomists, and market analysts. Investments are guided by the perceived risk profile, which is subject to macroeconomic variables.

The most important macroeconomic indicators that are influencing the stocks in Nairobi securities exchange are GDP, inflation, the supply of money in the market, interest rates, exchange rates, foreign direct investment and production factors. The Nairobi securities exchange has recorded huge variations in share prices in the last recent years. In the year 2016 the market capitalization recorded a drop of 88.83 billion in the month of March (NSE, 2016) while in 2017 between the month of January and March the market made a loss of 17.6% (NSE, 2017).

Acikalin (2011) conducted a study of the Istanbul Stock Exchange (ISE) with the aim of establishing the influence of macroeconomic variables on the return on stocks. Their results showed there exists a long term and steady relationship between ISE index and macroeconomic variables. The study did not incorporate all the major macroeconomic variables. It only focused on foreign exchange as the major variable. Mileris (2014) studied the impact of macroeconomic factors on

performance in commercial banks in the European Union. The study confirmed that the macroeconomic strength of a country is a critical factor in performance of commercial banks. The study did not investigate how macroeconomic factors influence the index volatility of banks.

In Ghana, Issifu, Akyeampong, and Opoku, (2019), investigated the macroeconomic variables that affected the loan performance of commercial banks focusing on Home Finance Company Bank. The study however, did not link the influence of macroeconomic variables on securities market volatility which the present study aims to assess.

Onchomba (2016) in Kenya conducted an assessment to establish the connection between macroeconomic elements and mortgage firms' non-performing loans. The research concluded that GDP growth, high unemployment, high real interest rate, loan losses reserve ratio, significantly increased non-performing loans but the context was specific to mortgage institutions. The study did not focus on index volatility and only investigated the relationship with the non-performing loans.

Hussein (2016) looked at the interrelation of macroeconomic variables and volatility of stock prices for those companies that were listed at the NSE. The study used money supply, export earnings and inflation as the independent variables. The study found that broad money, interest rates negatively influences stock prices while rate of exchange and export earnings positively influences share prices. The study did not relate how GDP influences the securities volatility.

In Kenya, various studies have been carried out on stock market volatility; but, relating rates of interest, inflation, GDP and rates of exchange on stock market volatility had not been widely done in the firms listed at the Nairobi securities exchange. Motivated by this knowledge gap, therefore the research study sought to fill this knowledge gap by answering the question: Does a relationship exist between macroeconomic variables and stock market volatility of firms trading at the Nairobi Securities exchange?

1.3 Research Objective

The general objective is to establish the influence of macroeconomic variables changes in Nairobi securities exchange index volatility

Specific Objectives

The study specifically sought

- i. To establish the influence of interest rates in Nairobi securities exchange index volatility
- ii. To determine the influence of inflation rates in Nairobi securities exchange index volatility
- iii. To establish the influence of exchange rate in Nairobi securities exchange index volatility
- iv. To determine the influence of GDP in Nairobi securities exchange index volatility

1.4 Value of the Study

For the managers of firms listed at NSE, the findings of this study provides valuable information to guide their management decision following the changes in the macroeconomic variables in Kenya in their endeavor to maximize the stakeholder's wealth. It furnishes them with the necessary knowledge to protect wealth of the shareholders. This information is of value to investors, investment managers, portfolio managers, investment analysts, speculators looking for quick arbitrage opportunities and market traders out to profit from the market.

The capital markets regulatory authorities use the information to advise the Government on policymaking and areas local market may be seeking Foreign Direct Investments. Policies must encourage capital growth to attract investors. The information also helps policymakers better manage the economy and be more efficient in developing stock markets. The Government through the Central bank formulates the monetary policies, fiscal policies, and exchange rates controls to ensure stable currency rates to foster economic growth and lower its spiral effects on the economy.

For the researchers and academicians, the findings serve as their reference on the area of macroeconomics and stock market volatility besides establishing areas for further studies, especially for future scholars. The study brings much contribution to the current literature in the field of macroeconomic variables and securities volatility. It also acts as an incentive for further research to improve and extend the present research in the area especially in Kenya.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter assesses the macroeconomic variables and stock market volatility. From this assessment, broad categories are determined that help in the identification of the significant relationship between macroeconomic factors and index volatility. Particularlt the chapter dealt with the theoretical framework guiding the research, macroeconomic variables, and empirical review and research gaps.

2.2 Theoretical Review

This section of the study analyses the different theories that were used to shed light on the macroeconomic variables and stock market volatility. The study was guided by the following theories; modern portfolio theory, arbitrage pricing theory and capital asset pricing model.

2.2.1 Modern Portfolio Theory

Markowitz in (1952) pioneered modern portfolio theory (MPT), in his paper "Portfolio Selection," published in 1952 by the Journal of Finance. The theory describes the way risk-averse investors establish portfolios to boost their return based on a particular market risk, as risks are inherent parts of higher reward. Based on the theory, efficiency frontier can be created to maximize returns. The theory points out that return characteristics and investment's risks should be evaluated by the way the investment impacts the overall returns and risks (Doganoglu, 2010).

According to Fantazzinni (2013), modern portfolio theory points out that, investors avoid risks and so are more likely to invest in portfolios that are less risky. Investors only invest in risky portfolios if they promise high returns as compared to the less risky ones. The only difference with investors is the way they look at risks as that depends on risk aversions characteristics of an individual. For this reason, an investor will not put money in a portfolio in case there is alternative portfolio with a more favorable risk-anticipated return profile.

This theory is significant to the research because it seeks to maximize the investors return on the portfolio and to minimize the portfolio risk in any level of expected return of a portfolio. Markowitz (1952) therefore encourages diversification of assets to avoid market risks. This mitigates in controlling both the kind and the amount of expected risk and return. The theory emphasizes determination of the numerical interactions among the specific securities that encompass the total investments rather than analyzing the characteristics of individual investments.

2.2.2 Arbitrage Pricing Theory

Ross (1976) created arbitrage-pricing theory, a theory that estimates a relation between the returns of an asset and a portfolio in a linear combination of several independent macroeconomic variables. APT utilizes the expected returns of risky assets and the risk premium of several macroeconomic factors while CAPM uses the expected returns in a market (Burmeister, 2011). The APT model helps arbitrageurs' profit by taking advantage of price of securities that according to the model are mispriced.

According to the APT model, unpredictable nature of macroeconomic variables determines the anticipated rate of return on assets. This shows that risk factors are important in assets pricing (Holbrook, 2010). APT is arguably a moderate diverse model for evaluating the prices of assets. According to the APT model, the macroeconomics variables, which are not multi-collinear with each other, influence partially the stock prices.

2.2.3 Capital Assets Pricing Model

Treynor (1961), Sharpe (1964), Linter (1965) and Mossin (1966) introduced the CAPM each on their own, where they used the diversification work of Markowitz (1960) as their foundation. How both systematic risk and expected return for assets relate, is the major issue that the capital asset pricing model (CAPM) describes mostly on stocks. In the finance industry, CAPM is mostly used in; pricing of the risky securities, ensuring that expected returns are generated on assets and ensuring that capital costs are calculated. Time value and risk are the two factors that CAPM uses in compensating the investors (Aguiar & Broner, 2006). The period of time that investors have placed their money is usually compensated through the risk-free rate. Government bonds are the primary yields of risk-free rates.

The systematic and unsystematic risks are identified and acknowledged by capital asset pricing model (CAPM). Fletcher adds that rewards are only given to the systematic risk as unsystematic is diversifiable. Industry or firm specific risks are unsystematic risks, strikes are also risks, natural disasters for example bad weather for farmers is a risk and this is why specific risk is not rewarded in CAPM as it is not part of the return of stock.

Portfolio management can be used in diversifying a risk argument. Moffett, Stonehill and Eiteman (2015) argue that diversification cannot be done on systematic risks, as market portfolio is also related to it. The capital asset pricing model ensures that as a risk is identified, exchange rates are derived and that investors view principles as important.

2.3 Determinants of Stock Market Index Volatility

Macroeconomic factors are relevant to a whole economy at national/regional level and influence a large number of people population. Macroeconomic variables like GDP, savings, inflations, investment, and unemployment are key indicators of economic performance and so are monitored closely by businesses, governments, and consumers. This study focuses on key factors namely; GDP, interest rates, inflation rates and exchange rate in relation to stock market returns.

2.3.1 Interest Rates

The interest rate is one of the issues influencing the economy. A high interest rate signifies a rigid monetary policy. It is expensive for companies to borrow loans when interest rates are high. Apart from the fact that it would be costly for companies to invest, it would also be costly for companies and individuals to make payments of mortgages and loans. Therefore, demand tends to go down with high interest rates and increase with low interest rates in an economy (Lipsey & Chrystal, 2010). According to Dornbusch and Fischer (2010), there is a direct increase in interest rates in the stock market when monetary authorities increase the interest rate as it becomes more expensive for financial institutions to borrow money from the central bank.

According to Martinez-Moya (2013), transformations in interest rates affect the anticipated cash flows in the future and the discount rate for valuing the cash flows, and consequently the value of a Company. The alterations in interest rate affect significantly the value of non-financial firms in three ways. First, a rise in interest rate leads to an increase in expenses for a company in debt and negative impact on the cash flows of a company in the future. Due to these negative impacts, changes in interest rates lead to reduction in dividends. Furthermore, high interest rates affect negatively the investment behaviors of a company (Fantazzinni, 2009).

2.3.2 Inflation Rates

Tucker (2014) defines inflation as an escalation in the general prices of services and goods in an economy. Inflation is an upsurge in the general average level of prices. Sloman and Kevin (2011) argue that inflation can be either cost-push inflation or demand-pull inflation. Liu and Shrestha (2008) claim that inflation has a negative impact on an economy which becomes noticeable over time especially in the real value of money, thereby negatively affecting the anticipated returns and prices of stocks in a highly inflationary environment. For instance, the growth of the stock market decreases as investment reduces due to high inflation rates (Yang, 2014).

According to Martinez-Moya (2013), inflation rate has been rising slowly in developing countries. There is a high risk of inflation due to the much money circulating contrary to the conditions of a growing economy and therefore investors and market traders in developing countries are giving this as a reason for lessening stock market portfolios.

When there is risk of rising inflation, the central banks attempt to regulate the inflation by increasing interest rates with the hope of attracting investors to put their money in fixed income instruments in order to draw excess liquidity from the system.

2.3.3 Exchange Rate

According to Acikalin (2011), variations in the rate of exchange affect the proceeds in the financial statements of international enterprises in the world leading to changes in their stock prices. This traditional approach believes that fluctuations in the rate of exchange results in variations in stock price. This approach tries to show the connection between rate of exchange and stock prices. Exchange variations affect firms' standards by enhanced competitive edge and changes in the financial position of the firm, currency denomination, finally reducing companies "profit and stock" (Liu & Shrestha, 2008).

The currency value is an important factor influencing equity prices and business profitability. The importance of the currency value has been due to the high rise in capital movements and world trade (Kim, 2013). Exchange rate changes influence the competitiveness of international companies as it affects the prices of exports and imports. For this reason, the value of a currency affects the value of a company as its affects the flow of cash in the future. For economic theory, variations in exchange rates affect the profitability and investment of a company and its impact is seen in the financial performance of that particular company. Consequently, movements in a firm's operations influence stock returns.

2.3.4 Gross Domestic Product

GDP measures the monetary value of the total number of finished services and goods manufactured in a country in a year. GDP is measured yearly and consists of all consumption by public consumers and private consumers, government outlays, exports less imports, and investments within a borderline. The GDP is a key prime pointer of the fiscal performance of a country. It is calculated in two methods, which are tallying up the income of everyone's income and by totaling the worth of all finished services and goods manufactured in a country in a whole year (Campbell, 2011)

Dornbusch & Fischer (2010), found that the price levels of the current stock are associated positively to anticipate future levels of actual economic activities, as measured by GDP. The levels of GDP will probably influence stock returns by affecting the profitability of companies. A rise in output can lead to higher sales hence raising stock prices and the opposite result would be experienced in a recession (Dornbusch & Fischer, 2010). Theoretically, increase in stock prices should match exactly the growth in real GDP.

2.5 Empirical Review

2.5.1 Global Studies

Sri Lanka was investigated by Menike (2016), on how their stock market was affected by macroeconomic factors. The monthly information on stock markets between September 2005 to December 2015 was used by the study. All individual stocks were ran with the eight macroeconomic factors using a multivariate regression. The study established that

money supply, exchange rate, interest rate, and inflation rate were the factors that affected equity prices

Zhang and Daly (2015), examined how macroeconomic and bank particular factors influence banks' profit in China. The study period covered was 2004 to 2010. The population of the research comprised all the banks in China; a sample of 124 banks with complete data set was studied. Secondary data was acquired and utilized by the research. Data collected was analysed using regression analysis. The research shows that banks that are well-capitalized and lower credit risk are gainful while the profit of banks with increased expense is affected negatively.

Pakistan was also investigated by Kanwal and Nadeem (2013), to find out how profitability related to macroeconomic factors (inflation rate, interest rate, and GDP) in the public commercial banks. The research covered a period 2001-2011. Population comprised thirty-eight banks; a sample of twenty-three listed banks was studied. Data was sourced from secondary sources and analyzed using correlation analysis, descriptive statistics as well as pooled ordinary least squares regression analysis. The researchers found a strong relation that existed between both interest rates and profitability, a very small relationship between profitability and GDP and weak relation between bank profitability and inflation rate.

2.5.2 Regional Studies

A study by Osamwonji and Chijuka (2016) was done on the impact of macroeconomic issues on the profitability of commercial banks in Nigeria. The research was

based on 1990 to 2013 secondary data obtained in Nigeria. The secondary data was obtained from central bank as well as firms yearly reports and financials. Data analysis was by way of ordinary regression. The study found a considerable positive relationship between GDP and return on equity, a significant negative connection between interest rate and return on equity, and an insignificant negative relation involving inflation rate.

In Ghana, Issifu, Akyeampong, and Opoku, (2019), investigated the macroeconomic variables that affected the loan performance of commercial banks focusing on Home Finance Company Bank. The study gathered data for the period 2008-2015. The study applied autoregressive distributed lag bounds test of co-integration as the estimation technique. The conclusion made by the study was that macroeconomic variables that affect the performance of loans are T-bills and inflation. The study however, did not link the influence of macroeconomic variables on securities market volatility which the present study aims to assess.

Ogechi & Ikpesu (2017) investigated the macroeconomic determinants of non-performing loans in Nigeria, using time series data for the period 2005 to 2014 collected from Nigeria Deposit Insurance Corporation annual report, the study period of 2005 to 2014 was chosen. The results showed that Gross Domestic Product growth rate, inflation and exchange rate have a positive relationship with NPL and do not influence NPL in Nigeria.

2.5.3 Local Studies

Amata (2017) studied the effect of macroeconomic factors on stock market volatility in Kenya. The research examined the direct associations between inflation rate, interest rates, foreign exchange rate, instability of stock market, and gross domestic product. The research made use of the descriptive research design. The study employed both correlation and regression analysis. Interest rate, exchange rate, inflation rate and GDP, data was collected for a period of 14 years. Results from correlation analysis showed that there was a considerable association between all selected macro-economic variables and instability of the stock market.

Ongeri (2014) also in a research study investigated how macroeconomic factors affect the profitability of non-banking financial institutions in Kenya. The study used a descriptive research design and obtained secondary data on the one hundred and twelve firms that formed the population. The census study covered the period 2004 to 2013. The study found a strong positive association between the exchange rate and the return on assets and weak positive relation between GDP and interest rate, and returns on assets. The study however fails to indicate the impact of inflation rate on profitability, yet it was part of the intended analysis.

Maina (2013), investigated the correlation between macroeconomic factors and share prices of companies listed at the Nairobi securities exchange. Data was obtained from NSE and other financial intermediaries. The study used the regression model, the average monthly market returns of the main investment market segment namely Agricultural, Commercial, Financial and Industrial market

sectors were first examined without considering the effects of macroeconomic variables under study. The evaluation of the effects of the macroeconomic issues indicates that the greatest impact varies across the sectors.

2.6 Conceptual Framework

The framework shows the dependent and independent variables and how they relate to each other. Interest rate, inflation rate, exchange rate and GDP were the study's independent variables while stock market volatility was the dependent variable.

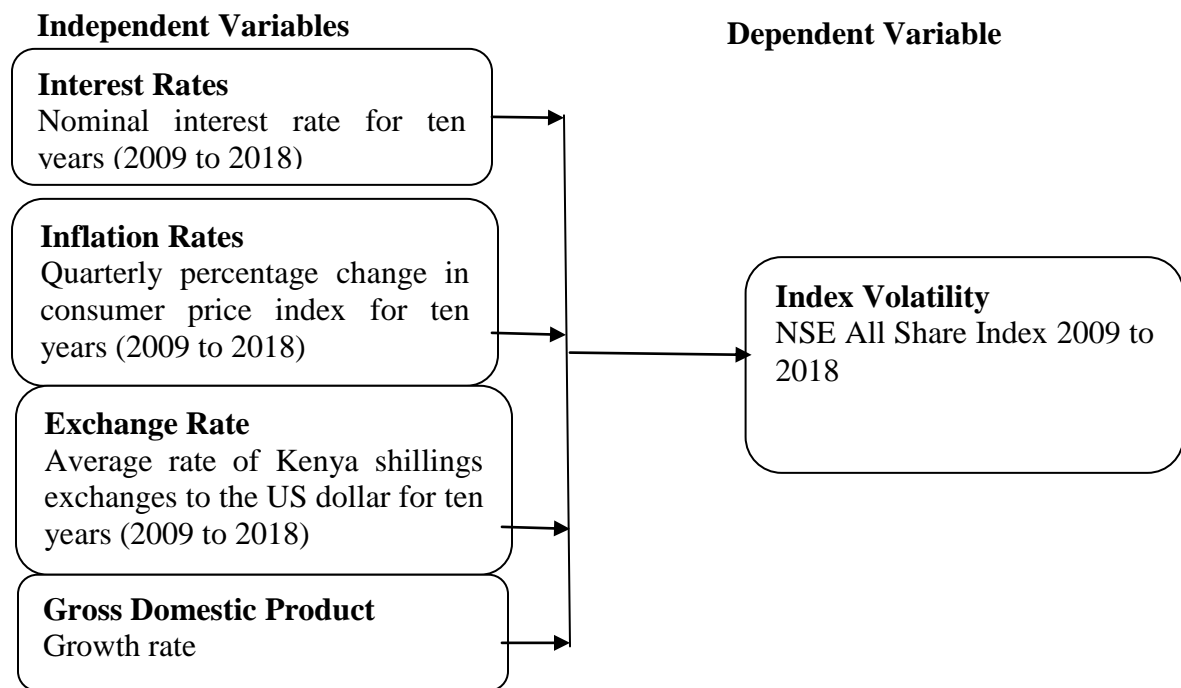


Figure 2.1: Conceptual framework (Research, 2019)

2.7 Summary of Literature Review

Research on macroeconomic variables and stock market volatility has been done locally but previous studies have produced mixed outcomes regarding the effect of macroeconomic variables on stock market volatility. Osamwonji and Chijuka

(2014) studied the influence of macroeconomic issues on profitability of commercial banks. Menike (2016) examined that the impact of macroeconomic factors on stock prices in the stock market in Sri Lanka. In a research, Kamande (2015) examined the macroeconomic variables and returns in the stock market return in Nairobi Securities Exchange. The research focused on inflation, government spending, the oil prices, and exchange rate as the macroeconomic variables. On the other hand, Amata (2017) researched the effects of macroeconomic variables on the instability in Kenyan stock market and realized that a significant association between all selected macro-economic factors and volatility in the stock market. Kamande (2015) undertook a research in macroeconomic factors and return on stock market return in Nairobi Securities Exchange. Ongeru (2014), also in a research study investigated how macroeconomic factors affect the profitability of non-banking financial institutions in Kenya.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter explains the research methodology. It explains the choice of the research design, research procedures, data collection techniques, sample design, data analysis method, and the population.

3.2 Research Design

The study utilized a descriptive research design. The design enabled the researcher to designate the characteristics of the variables of interest. The descriptive design was thus well suited to this study. The method was useful for this study as it described the characteristics of a large population.

3.3 Data Collection

Secondary data was acquired from the financial reports of respective firms. Data on the securities and their movement was acquired from the Nairobi Securities Exchange. Information on exchange rates and interest rates over the period of interest was acquired from the Central Bank of Kenya. Information on inflation trends was acquired from the Kenya Bureau of Statistics. Interest rates, inflation, and exchange rate information was also from published literature and financial reports of the firms. The study collected data for the last ten years 2009-2018.

3.4 Diagnostic Tests

The researcher performed tests on statistical assumptions i.e. test of regression assumption and statistics used. The regression assumptions were met through by ensuring that a diagnostic is conducted. The diagnostic tests that were conducted include multicollinearity, heteroscedasticity and normality test.

3.4.1 Multicollinearity

There exists a multicollinearity if the relationship between the two variables being tested in the study related moderately or highly in the multiple regression model. The multiple regression model results are skewed by the multicollinearity. The Variance Inflation Factor (VIF) will be used in determining the multicollinearity's severity. If the independent variables have a correlation with the dependent variable the variance of the coefficient's estimates is measured through the Variance Inflation Factor (VIF). There will be a 1 Variance Inflation Factor (VIF) if no multicollinearity is found. There is a moderate correlation showed by independent variables if the VIF indication is above 1 while a problematic multicollinearity is seen where there is an indication of between 5 and 10 VIF.

3.4.2 Heteroscedasticity

Levene test was employed to assess the equality of variances for the four variables calculated (credit risk management, firm size, earnings per share and profitability). When all observations do not have the same variation of the error term, they are implied as Heteroscedasticity. The error term variation is meant to be similar in all observation in the multiple regression analysis. The variance's equality is required in the assumption

that is violated by residuals which makes the minimum variance of the model coefficients unbiased. The Breusch-Pagan test will be used by the study to ensure that all observations have a constant variation of residuals when the null hypothesis is tested. A less than 0.05 level of significant p-value, will make the study variance to be violated in the assumption of the inference.

3.4.3 Normality Test

The level of significance in the study will be compared to the computed significant value using both skewness and kurtosis so as to make effective conclusions using the test. Residuals will be indicated to be normally distributed if the level of significance is lower than that of the computed significant value. The data will be said to depart from the normal distribution if its level of significance will be lower than the computed significant value.

3.5 Data Analysis

The quantitative data acquired was analyzed using Statistical Package for Social Sciences (SPSS) version 20. The results were presented using tables, percentages, and frequencies. Descriptive statistics were utilized to explain quantitatively the significant attributes of the variables using mean, frequency and standard deviation. Frequencies, percentages, and tables were used to present the findings.

3.5.1 Analytical Model

Multiple regression was utilized to describe the effects macroeconomic variables changes in Nairobi securities exchange index volatility. The regression model was illustrated below;

$$Y = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon$$

Y = Volatility index (Measured by NSE All Share Index 2009 to 2018)

β_0 = Constant

X_1 = Interest Rate (determined by nominal interest rate)

X_2 = Inflation Rate (determined by quarterly percentage change in consumer price index.)

X_3 = Exchange Rate (determined by average rate of Kenya shillings exchanges to the US dollar)

X_4 = GDP (Growth rate)

β_1 – β_4 are the regression co-efficient or variation introduced in Y by each independent variable

ε is the random error term accounting for all other factors that influence stock market volatility but is not seen in the model.

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter discusses the presentation and interpretation of the study findings. The purpose of the study was to establish the influence of macroeconomic variables changes in Nairobi securities exchange index volatility and it focused on the year 2009 to 2018. The data was there after analyzed based on the objectives of the study and the findings were presented as per the different objectives.

4.2 Descriptive Statistics

Descriptive analysis was done to establish the range, standard deviation, and mean of the both independent and dependent variables. The averages were done for the ten years' and the average means and standard deviations are shown in the table 4.1.

Table 4.1: Descriptive Statistics

Year	N	Minimum	Maximum	Mean	Std deviation
Interest Rate	40	13.0	19.1	15.7	0.543
Inflation Rate	40	3.8	14.0	7.7	0.745
Exchange Rate	40	78.2%	100.8%	94.2%	0.232
GDP Growth	40	3.3	8.4	5.7	0.719
Volatility index	40	10.2	26.0	18.2	0.834

Source: KNBS Statistics

Table 4.1 depicts volatility index of an average of 18.2% with a minimum of 10.2% and a maximum of 26.0%. The average of interest rate for the ten years was found to stand at 15.7%, with the highest year average (2012) having an interest rate of 19.1. The average inflation rate for the firms in ten years was established to be 7.7 with the highest being 14.0 and lowest average was 3.8. Further the descriptive statistics established that the exchange Rate within the ten years of study ranged between 78.2% and 100.8% with an average mean of 94.2% while the GDP growth was establishment range between 3.3 and 8.4 with 5.7 being the average.

Further, Figure 4.2 shows the share price volatility of NSE share index for 10 years from 2009 to 2018. The trend shows that volatility in share prices had been fluctuating up and down in the considered period with the highest and lowest fluctuation being witnessed around 2011 and 2017 respectively.

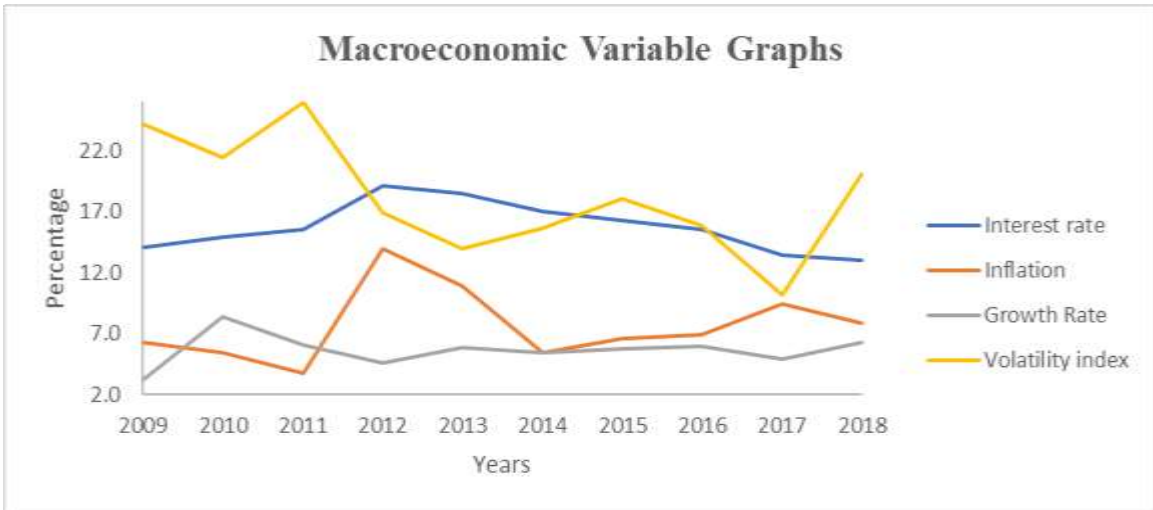


Figure 4.2 Macroeconomic Variables

Further, results show a decreasing trend of interest rates from 2012 to 2018 while the inflation trend had been fluctuating up and down with 2012 having the highest fluctuation. GDP growth also indicated up and down fluctuation while exchange rate indicated an increasing trend from 2012 to 2016 after which it remained constant for a while.

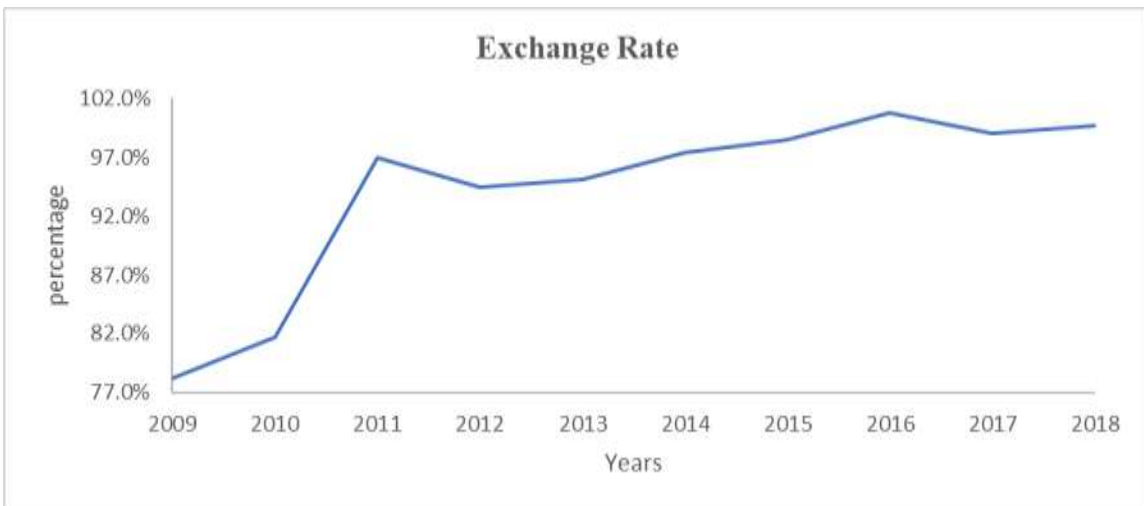


Figure 4.3 Exchange Rate

4.3 Diagnostic Tests

The study performed tests on statistical assumptions i.e. test of regression assumption and statistic used. This included test of normality, multicollinearity and Heteroskedasticity Test.

4.3.1 Normality Test

The level of significance in the study will be compared to the computed significant value using both skewness and kurtosis so as to make effective conclusions using the test. Residuals will be indicated to be normally distributed if the level of significance is lower than that of the computed significant value. The data will be said to depart from the normal distribution if its level of significance will be lower than the computed significant value (Rizal and Wah, 2011).

H_0 : Sample follows a Normal distribution,

H_a : Sample does not follow a Normal distribution.

Table 4.2: Tests of Normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Interest Rate	.337	39	.001	.417	39	.002
Inflation Rate	.214	39	.002	.306	39	.000
Exchange Rate	.196	39	.001	.289	39	.001
GDP	.171	39	.000	.236	39	.001
Volatility index	.123	39	.003	.165	39	.004

Source: Researcher 2019

This leads to the rejection of the null hypothesis that data on firm's characteristics under three variables (Interest Rate, Inflation Rate, Exchange Rate, GDP and Volatility index) we're not normally distributed.

4.3.2 Multicollinearity Test

There exists a multicollinearity if the relationship between the two variables being tested in the study related moderately or highly in the multiple regression model. The multiple regression model results are skewed by the multicollinearity. The Variance Inflation Factor (VIF) will be sued in determining the multicollinearity's severity. If the independent variables have a correlation with the dependent variable the variance of the coefficient's estimates is measured through the Variance Inflation Factor (VIF). There

will be a 1 Variance Inflation Factor (VIF) if no multicollinearity is found. There is a moderate correlation showed by independent variables if the VIF indication is above 1 while a problematic multicollinearity is seen where there is an indication of between 5 and 10 VIF (Baum (2006)). Results show that all the variables had variance inflation factors (VIF) of less than 10; Interest Rate (1.595), Inflation Rate (1.484), Exchange Rate (1.395), GDP (1.313) and Volatility index (1.296). This implies that there was no collinearity with the variables thus all the variables were maintained in the regression model.

Table 4.3: Collinearity Statistics

Variables	Tolerance	VIF
Interest Rate	.894	1.595
Inflation Rate	.831	1.484
Exchange Rate	.806	1.395
GDP	.793	1.313
Volatility index	.769	1.296

Source: Researcher 2019

4.2.3 Heteroskedasticity Test

Levene test was employed to assess the equality of variances for the four variables calculated. When all observations do not have the same variation of the error term, they

are implied as Heteroscedasticity. The error term variation is meant to be similar in all observation in the multiple regression analysis.

Table 4.4 Heteroskedasticity Test

F-statistic	11.38475	Prob. F(4,39)	.000
Obs*R-squared	0.923101	Prob. Chi-Square(4)	.001
Scaled explained SS	21.47693	Prob. Chi-Square(4)	.000
Prob(F-statistic)	0.000000		

Source: Researcher 2019

The variance's equality is required in the assumption that is violated by residuals which makes the minimum variance of the model coefficients unbiased. The Breusch-Pagan test will be used by the study to ensure that all observations have a constant variation of residuals when the null hypothesis is tested. A less than 0.05 level of significant p-value, will make the study variance to be violated in the assumption of the inference.

4.4 Correlation Analysis

A Pearson Correlation was computed to assess the relationship between macroeconomic variables and index volatility at Nairobi Securities Exchange. A significant negative association was established between interest Rate and volatility index ($r = -0.694$, $p=0.000$). A negative correlation means that an increase in one variable leads to a decrease in the other variable. In this case, an increase in interest rate would lead to a decrease in volatility index. The above findings are consistent with reports given by

Ogechi and Ikpesu (2017) who established a negative relationship between interest rates and bank performance. Further a significant negative correlation was revealed between inflation rate and volatility index ($r = -0.353$, $p = 0.007$) which implied that an increase in inflation rate would lead to a decrease in volatility index.

A correlation analysis was further computed to assess the relationship between exchange rate and volatility index. The findings indicated a strong negative correlation between the two variables ($r = -0.437$, $p = 0.012$). A negative correlation means that an increase in one variable leads to a decrease in the other variable. In this case, an increase in exchange rate would lead to a decrease in volatility index. Lastly, a strong positive correlation between the growth rate and volatility index was established ($r = 0.712$, $p = 0.004$). The relationship between the two variables was statistically significant $0.004 < 0.05$. A positive correlation means that an increase in one variable leads to an increase in the other variable. In this case, an increase in growth rate would lead to an increase of the volatility index.

Table 4.5 Correlations

		Volatility index	Interest Rate	Inflation Rate	Exchange Rate	Growth rate
Volatility index	Correlation Coefficient	1.000	-.694	-.353	-.437	.712
	Sig. (1-tailed)	.	.000	.007	.012	.004
	N	40	40	40	40	40
Interest Rate	Correlation Coefficient	-.694	1.000	-.142	-.037	
	Sig. (1-tailed)	.000	.	.000	.000	
	N	40	40	40	40	
Inflation Rate	Correlation Coefficient	-.353	-.142	1.000		
	Sig. (1-tailed)	.007	.000	.		
	N	40	40	40		
Exchange Rate	Correlation Coefficient	-.437	-.037			
	Sig. (1-tailed)	.012	.000			
	N	40	40			
Growth rate	Correlation Coefficient	.712				
	Sig. (1-tailed)	.004				
	N	40				

4.5 Regression Analysis

A multiple linear regression analysis was performed with volatility index being the dependent variable, and Interest Rate, Inflation Rate, Exchange Rate and GDP Growth being independent variables. The analysis aimed at establishing a linear relationship between the dependent variable and the independent variables. The model summary was as shown in Table 4.6.

Table 4.6 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.812	0.659	0.620	2.829

The model fit in this study was evaluated by the coefficient of determination. The adjusted R^2 is the percentage of the variance in the dependent variable explained uniquely by the independent variables. The model had an average adjusted coefficient of determination (R^2) of 0.620 which implied that 62% of the variations on Share volatility index at Nairobi Securities Exchange were explained by the independent variables focused on this study that is; Interest Rate, Inflation Rate, Exchange Rate and GDP Growth rate. The study further tested the significance of the model using the ANOVA technique. The study results are as tabulated in Table 4.7.

Table 4.7 ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	589.37	4	147.34	16.94	.000
1	Residual	304.27	35	8.69		
	Total	893.64	39			

The findings were found to be ideal in making the study's conclusions as established by the ANOVA statics in the regression model that showed a 0.05% significance level as it was less than 5%. The critical value was less than the calculated value ($F = 16.94$, $P < 0.05$) an indication that independent variables are good predictors of Share volatility index. The study results are as shown in Table 4.7.

Table 4.8 Coefficients

Model	Unstandardized		Standardized	t	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	11.464	1.645		6.9689	.000
Interest Rate	-0.428	0.129	-0.405	-3.3178	.001
1 Inflation Rate	-0.294	0.039	-0.238	-7.5384	.000
Exchange Rate	-0.362	0.133	-0.314	-2.7218	.008
GDP Growth	0.593	0.196	0.503	3.025	.003

The generated output as per the SPSS is as presented in Table 4.11 above, thus the equation is as shown below:

$$Y = 11.464 - 0.428X_1 - 0.294X_2 - 0.362X_3 + 0.593X_4$$

As shown from the regression model, a unit increase in interest rate while holding all the other factors constant would lead to a decrease of volatility index at NSE by a factor of 0.428. Regression results also revealed that Inflation Rate has significance and negative influence on volatility index at Nairobi Securities Exchange as indicated by $\beta_1 = -0.294$, $p = 0.000$. The implication is that a unit increase in inflation rate would lead to a decrease on volatility index at Nairobi Securities Exchange by $\beta_1 = -0.294$. Exchange Rate was found to have a negative significance influence on volatility index at Nairobi Securities Exchange as indicated by $\beta_1 = -0.362$, $p = 0.008$ hence a unit increase in Exchange Rate while holding all the other factors constant would lead to a decrease on volatility index at Nairobi Securities Exchange. GDP Growth was found to have a positive significance influence on volatility index at Nairobi Securities Exchange. Hence a unit increase on GDP Growth while holding all the other factors constant would lead to an increase on the volatility index at Nairobi Securities Exchange. This finding was in line with Ogechi and Ikpesu (2017) who showed that Gross Domestic Product growth rate, exchange rate have a positive relationship with NPL and do not influence NPL in Nigeria.

4.6 Discussion of the Findings

Findings derived from the regression model indicated that macroeconomic variables (Interest Rate, Inflation Rate, Exchange Rate and GDP Growth) had significant influence

on the Volatility index of Nairobi Securities Exchange. This finding correlate to Amata (2017) who noted a considerable association between all selected macro-economic variables and instability of the stock market. The four independent variables studied explained a substantial 62% of Volatility index of Nairobi Securities Exchange as represented by Adjusted R squared (0.620). Other factors and random disparities not studied in this study were found to contribute a measly 38% of the Volatility index of Nairobi Securities Exchange. Descriptive statistics indicated that volatility in share prices had been fluctuating up and down in the considered period with the highest and lowest fluctuation being witnessed around 2011 and 2017 respectively. Further, results show a decreasing trend of interest rates from 2012 to 2018 while the inflation trend had been fluctuating up and down with 2012 having the highest fluctuation. GDP growth also indicated up and down fluctuation while exchange rate indicated an increasing trend from 2012 to 2016 after which it remained constant.

According to Martinez-Moya (2013), transformations in interest rates affect the anticipated cash flows in the future and the discount rate for valuing the cash flows, and consequently the value of a company. Martinez-Moya added that rise in interest rate leads to an increase in expenses for a company in debt and negative impact on the cash flows of a company in the future. Due to these negative impacts, changes in interest rates lead to reduction in dividends. Furthermore, high interest rates affect negatively the investment behaviors of a company. Similarly, this study established a negative association between interest rate and volatility index at NSE. It was established that a unit

increase in interest rate while holding all the other factors constant would lead to a decrease of volatility index at NSE by a factor of 0.428.

Further, regression predictions revealed that Inflation Rate had significance and negative influence on volatility index of Nairobi Securities Exchange as indicated by $\beta_1 = -0.294$, $p=0.000$. The implication was that a unit increase in inflation rate would lead to a decrease on volatility index at Nairobi Securities Exchange by $\beta_1 = -0.294$, which was found significant at $p < 0.05$. Finding concurred to that of Liu and Shrestha (2008) who claimed that inflation had a negative impact on economy.

Exchange rate changes influence the competitiveness of international companies as it affects the prices of exports and imports (Kim, 2013). According to Acikalin (2011), variations in the rate of exchange affect the proceeds in the financial statements of international enterprises in the world leading to changes in their stock prices. Finding from regression established that Exchange Rate had a negative significance influence on volatility index at Nairobi Securities Exchange as indicated by $\beta_1 = -0.362$, $p=0.008$ hence a unit increase in Exchange Rate while holding all the other factors constant would lead to a decrease on volatility index at Nairobi Securities Exchange. On the other hand, decrease in Exchange Rate while holding all the other factors constant would lead to an increase on volatility index at Nairobi Securities Exchange.

From regression predictions, it was noted that GDP had a positive significance influence on volatility index at Nairobi Securities Exchange. Hence a unit increase on GDP Growth while holding all the other factors constant would lead to an increase on the volatility index at Nairobi Securities Exchange. This finding was in line with Ogechi and Ikpesu

(2017) who showed that Gross Domestic Product growth rate, exchange rate have a positive relationship with NPL and do not influence NPL in Nigeria. A rise in output can lead to higher sales hence raising stock prices and the opposite result would be experienced in a recession (Dornbusch & Fischer, 2010).

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of key findings made by the study, conclusion drawn from the findings, and recommendations proposed by the researcher. The conclusions and recommendations are focused on addressing the main objective of the study. This chapter also discusses suggested areas for future research.

5.2 Summary of findings

This section presents the key findings as considered under each objective in the study. Descriptive statistics indicated that volatility index had been fluctuating up and down in the considered period with the highest and lowest fluctuation being witnessed around 2011 and 2017 respectively. Further, results show a decreasing trend of interest rates from 2012 to 2018 while the inflation trend had been fluctuating up and down with 2012 having the highest fluctuation. GDP growth also indicated up and down fluctuation while exchange rate indicated an increasing trend from 2012 to 2016 after which it remained constant.

Findings from this study showed that a unit increase in interest rate while holding all the other factors constant would lead to a decrease of volatility index at NSE. This implied that there existed a negative association between interest rate and volatility index at NSE. Therefore, on the other hand it meant that if interest rate is reduced by firms at Nairobi securities exchange it would lead to an increase in the volatility index. Results also showed a negative association between inflation rate and volatility index of Nairobi

Securities Exchange. This meant that if a country's inflation rate increases it would lead to a decrease of volatility index at Nairobi Securities Exchange. However, if inflation rate decreases it would lead to an increase of volatility index at Nairobi Securities Exchange.

Further, exchange rate had a negative influence on volatility index at Nairobi Securities Exchange. The negative effect was found significant which meant that a unit increase in Exchange Rate while holding all the other factors constant would lead to a decrease on volatility index at Nairobi Securities Exchange. On the other hand, decrease in Exchange Rate while holding all the other factors constant would lead to an increase on volatility index at Nairobi Securities Exchange. However, from the regression predictions, it was noted that GDP growth had a positive significance influence on volatility index at Nairobi Securities Exchange. Hence a unit increase on GDP Growth while holding all the other factors constant would lead to an increase on the volatility index at Nairobi Securities Exchange.

5.3 Conclusion

This research offered an ample review of the influence of macroeconomic variables changes in Nairobi securities exchange index volatility. Based on the findings of the research, it was concluded that macroeconomic variables (Interest Rate, Inflation Rate, Exchange Rate and GDP Growth) had significant influence on the Volatility index of Nairobi Securities Exchange. Interest Rate, Inflation Rate and Exchange Rate had a negative effect on volatility index while GDP growth had a positive effect on volatility index at Nairobi securities Exchange.

Researcher concluded that a unit increase in interest rate while holding all the other factors constant results to a decrease of volatility index at NSE while a decreased in interest rate at Nairobi securities exchange leads to an increase in the volatility index. Hence evident negative association between interest rate and volatility index. It was also concluded that there exist a negative association between inflation rate and volatility index of Nairobi Securities Exchange. This meant that if a country's inflation rate increases it results to a decrease of volatility index at Nairobi Securities Exchange. However, if inflation rate decreases it results to an increase of volatility index at Nairobi Securities Exchange.

Lastly, researcher concluded that exchange rate has negative association with volatility index at Nairobi Securities Exchange. The negative effect is significant hence a unit increase in Exchange Rate while holding all the other factors constant leads to a decrease on volatility index at Nairobi Securities Exchange. On the other hand, decrease in Exchange Rate while holding all the other factors constant results to an increase on volatility index at Nairobi Securities Exchange. However, from the regression predictions, study concluded that a unit increase on GDP Growth while holding all the other factors constant resulted to an increase on the volatility index at Nairobi Securities Exchange. Hence GDP growth had a positive significance influence on volatility index at Nairobi Securities Exchange.

5.4 Recommendations for Study

The finding revealed a negative association between interest rate and volatility index at NSE. Therefore, this study recommends Central Bank of Kenya to come up with an

effective policy on interest rates to ensure that their rise and fall does not adversely impact the Kenyan economy.

GDP growth was found to positively affect volatility index. Hence, the study recommends the government should ensure a stable economy and institute policies to ensure that the economy is growing to enhance the volatility index.

Further, study recommends that the government through its policy makers should come up with measures and policies that will help control and stabilize inflation rate fluctuation thus creating investor confidence in the securities market. This will consequently lower the stock market volatility thus restoring the confidence of the investors in stock market and increasing market investment activity.

Further, exchange rate had a negative influence on volatility index at Nairobi Securities Exchange. Therefore, the monetary committee department of central bank of Kenya need to maintain a stable foreign currency exchange if the activities at the stock exchange are to be promoted.

5.5 Suggestions for Further Study

This study utilized regression model in analyzing influence of macroeconomic variables changes in Nairobi securities exchange index volatility. Additional research can be undertaken using a different model like the granger causality test to test the causal influence of macroeconomic variables changes on volatility index.

Additionally, the study focused on interest rates, inflation, exchange rate and GDP growth to determine their influence on volatility index. Additional study can be carried using other variables like political stability, balance of payments, taxation among other variables.

The duration of the study could be increased to focus on a long term effect of more than 10 years. From the empirical studies reviewed during the research project, it was evident that long run studies had a near uniform conclusion with other studies than the short run.

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APPENDICES

APPENDIX I: DATA COLLECTION SHEET

Variable	Measure	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Stock Market Volatility	Measured NSE All share index 2009 to 2018										
Interest Rate	Nominal interest rate										
Inflation rate	Quarterly percentage change in consumer price index.										
Exchange Rate	Standard rate of										

	Kenya shillings exchanges to the US dollar										
Gross Domestic Product	Growth rate										

APPENDIX II: MACROECONOMIC VARIABLES DATA

QUARTERLY AVERAGE MACROECONOMIC VARIABLES DATA OVER TEN YEARS FOR NAIROBI SECURITIES EXCHANGE						
Year	Quarters	Interest rate	Inflation	Exchange Rate	Growth Rate	Volatility index (%)
2009	Q1	13.6	6.4	77.3%	3.0	24.3
	Q2	14.2	6.3	77.9%	3.2	28.2
	Q3	14.3	6.2	78.60%	3.3	23.2
	Q4	14.3	6.2	79.00%	3.5	21.2
Average		14.1	6.3	78.2%	3.3	24.2
2010	Q1	14.4	6.0	79.30%	4.9	17.7
	Q2	14.7	5.4	81.50%	8.7	28.5
	Q3	15.2	5.5	82.50%	9.6	21.9
	Q4	15.2	5.0	83.40%	10.5	17.6
Average		14.9	5.5	81.7%	8.4	21.4
2011	Q1	15.3	4.5	90.50%	8.3	19.3
	Q2	15.5	4.0	96.60%	6.7	21.8
	Q3	15.8	3.1	99.90%	5.4	30.9
	Q4	15.8	3.4	101.10%	4.1	31.9
Average		15.6	3.8	97.0%	6.1	26.0
2012	Q1	17.8	7.8	99.20%	4.0	14.5
	Q2	18.9	11.6	97.00%	4.5	21.2
	Q3	19.6	16.8	93.20%	4.7	14.2
	Q4	20.2	19.8	88.30%	5.3	17.8
Average		19.1	14.0	94.4%	4.6	16.9
2013	Q1	19.3	18.3	92.40%	5.3	12.5
	Q2	18.5	12.5	94.80%	5.8	16.4

	Q3	18.4	8.6	96.20%	6.1	14.6
	Q4	17.6	4.3	97.30%	6.4	12.4
Average		18.5	10.9	95.2%	5.9	14.0
2014	Q1	17.6	4.0	97.30%	5.8	17.8
	Q2	17.0	4.7	97.40%	5.5	12.2
	Q3	17.0	5.9	97.40%	5.0	14.8
	Q4	16.6	7.3	97.60%	5.3	17.8
Average		17.1	5.5	97.4%	5.4	15.7
2015	Q1	16.5	7.1	97.90%	5.4	15.7
	Q2	16.3	6.4	98.50%	5.6	12.9
	Q3	16.3	6.6	98.70%	5.8	28.02
	Q4	16.0	6.1	99.10%	6.1	15.7
Average		16.3	6.6	98.6%	5.7	18.1
2016	Q1	16.1	6.0	99.90%	6.1	16.8
	Q2	16.0	6.7	100.20%	5.9	19.4
	Q3	15.9	7.3	101.20%	5.8	13.2
	Q4	14.0	7.5	101.70%	5.9	14.1
Average		15.5	6.9	100.8%	5.9	15.9
2017	Q1	13.6	7.7	100.20%	5.6	11.2
	Q2	13.6	8.8	99.40%	5.1	10.3
	Q3	13.3	9.4	99.10%	4.4	9.5
	Q4	13.1	11.9	97.30%	4.4	9.9
Average		13.4	9.5	99.00%	4.9	10.2
2018	Q1	13.1	11.6	97.60%	5.5	19.3
	Q2	13.1	8.4	99.30%	5.8	16.1
	Q3	13.0	6.3	99.50%	6.2	14.8
	Q4	12.9	5.1	102.30%	7.6	30.2

Average		13.0	7.9	99.7%	6.3	20.1
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