SELECTED MACROECONOMIC VARIABLES AND STOCK MARKET VOLATILITY: EVIDENCE FROM THE NAIROBI SECURITIES EXCHANGE

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DECLARATION

I, the undersigned, declare that this is my original work and has not been presented to any institution or university other than the University of Nairobi for examination.

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

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DEDICATION

I dedicate this work to my children Bradbury and Kouri. I thank you very much for the love, Patience and sacrifices that you have made for me. I have been forced to be away from you most of the time and at the hour of need but with your understanding, patience and prayers, we have reached this far.

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ABBREVIATIONS AND ACRONYMS

ANOVA   Analysis of Variance

APT   Arbitrage Pricing Theory

ATS   Automated Trading System

CMA   Capital Markets Authority

CPI   Consumer Price Index

EMH   Efficient Market Hypothesis

GDP   Gross Domestic Product

KNBS   Kenya National Bureau of Statistics

MIMS   Main Investment Market Segment

MPT   Modern Portfolio Theory

NASI   NSE All Share Index

NSE   Nairobi Securities Exchange

NSE 20   Nairobi Securities Exchange Top 20 Share Index

SPSS   Statistical Package for Social Sciences

VIF   Variance Inflation Factors

ABSTRACT

Both theoretical and empirical literatures posit that the thriving of a nation is directly associated with macro-economic variables like unemployment, GDP, inflation, remittances, money supply, interest and exchange rates. Share price movements are influenced by variations in economic fundamentals and these fundamentals' affect future prospects. The study objective was to determining how selected macro-economic variables influence stock market volatility at the NSE. The predictor variables were economic growth, interest rates, exchange rates, inflation rates, money supply and external debt. Stock market volatility was the response variable that the study intended to explore and it was given by standard deviation of Nairobi All Share Index (NASI) on a quarterly basis. A ten year period (2010-2019) was chosen for the study and the quarterly data from the period collected from a secondary source. A descriptive design was chosen and analysis was made using the multiple linear regression model to determine how the selected variables relate. SPSS version 23 was utilized for analysis. From the results from the software used, the R-square value was 0.962 which can be translated to mean that 96.2% of the variations in stock market volatility at the NSE are attributable to the six selected independent variables and the 3.8 percent remainder are attributable to other factors beyond the scope of this research. The study also revealed a strong connection of predictor variables and stock market volatility (R=0.981). ANOVA results at 5% significance level show an F statistic of 171.468 hence the model was found appropriate in explaining stock market volatility at the NSE. Additionally, the results showed that individually, interest rate, inflation rate, economic growth and money supply are statistically significant factors affecting stock market volatility while exchange rate and external debt do not substantially determine stock market volatility at the NSE. The recommendation made by the study was that more focus should be placed by policy makers to the current levels of interest rates, economic growth and inflation rates since they significantly influence stock market volatility measured at the NSE.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Stock market volatility is a domain of finance which has remained and will continue to be the focus of finance executives and scholars for a long time to come because of its centrality in investment decisions. Because of the importance attached to stock market volatility, great attempts have been made to understand it over time in terms of factors that contributes to its fluctuations (Abata, 2014). The connection existing amongst macroeconomic factors and stock market volatility is a subject that has interested many scholars and practitioners. Often times, it is proved that stock market volatility is dictated by some common macroeconomic variables like rate of interest, gross domestic product, inflation, money supply, public debt and exchange rate (Gan, Lee & Zhang, 2006).

Three theories namely; Arbitrage Pricing Theory (APT), Efficient Market Hypothesis (EMH), and the Modern Portfolio Theory (MTP) were the foundation of this study. Ross (1976) classical model of APT will be the anchor theory as it links macroeconomic variables to stock market fluctuations. Malkiel and Fama (1970) in their study of EMH suggested that the prevailing stock price is a representation of the value of an organization and it is hard to make an additional earning by utilizing the information available. This study is supported by the EMH theory where prices at the stock market are a reflection of happenings in the macroeconomic variables disparity. The modern portfolio theory backs this study in that the prices in the financial markets reflect events in the macroeconomic variables disparity. The influence of macro-economic variables on

financial market returns is then reflected through stock market volatility (Markowitz, 1952).

In Kenya, the Nairobi Securities Exchange (NSE) is the institution tasked with performing the functions of a stock market. Among many other objectives and roles, are to promote and enhance thrift culture, and/or saving by providing alternate methods of making investments and assisting in transferring these savings to investment in productive enterprises and quoted stocks. The NSE is currently trading its shares at a rate of more than 100 million shares monthly, giving it a critical role in Kenya's economic growth. This is facilitated through enabling idle savings and money to become more productive by linking lenders and borrowers of funds at the lowest possible cost. The market has been useful in informing the public of the benefits of stock market and boosting the investors' confidence by requiring quoted firms to have their financial reports published.

1.1.1 Selected Macroeconomic Variables

Macro-economic variables denotes those variables which are of general significant to the position of a country's economy to at the national face and regional face (Sharma & Singh, 2011). Mishkin (2004) defines macro-economic variables as the factors which are relevant to an economy as a whole and shake a great populace relatively than a select few of them. Macro-economic variables are majorly closely scrutinized by business, governments, and consumers due to their influence on overall performance of the economy. Kwon and Shin (1999) in their study concluded that economic growth, interest rates, unemployment rate, currency exchange rate, inflation, money supply, government debt and balance of payments are the most impactful macroeconomic variables.

Macro-economic factors are of importance as their impacts is not felt by individual alone but also the large population and in addition it has an effect on the balance of payments, unemployment rate, inflation rates, income levels and interest rates. These impacts are associated with the economic structure, the decision making and performance behavior at the broader level of the economy. Their impacts will affect the economy in terms of output levels, national income, inflation, consumption, international trade and finance and investment and savings (Sharma & Singh, 2011). The macroeconomic variables indicates the prevailing trends in the economy (Khalid et al., 2012).

The measurement of macroeconomic variables varies depending on the exact variable in question. Economic growth implies the increase in a nation's capacity to produce goods and services and its measurement index is the gross domestic product growth rate (Muthama, Mbaluka & Kalunda, 2013). Central bank lending rate is usually used as measure of interest rates. Government external borrowing refers to the amount of money the government has borrowed outside the country. It is usually measured as a percentage or as a ratio of GDP (Simiyu & Ngile, 2015). Inflation is usually measured using either the Consumer Price Index (CPI) or the inflation rate while money supply which represents the amount of money in circulation is usually measured by M2 (Shrestha & Subedi, 2014).

1.1.2 Stock Market Volatility

This refers to the uncertain and probabilistic nature of financial assets prices selling in the stock markets (Bhowmilk, 2013). As a concept, volatility is simple and intuitive. It measures divergence and spread about a central tendency. To be more significant, it is an estimate of how far the current asset price drifts from the average of its past prices (Raju

& Ghosh, 2004). It is invaluable to note that there will most certainly be a degree of volatility in any market, which in most cases can be viewed as something that should be valued; this is to say that the stock market volatility is in some cases desired in order to make the process of resource allocation easy and effective. But if the volatility increases eventually creating wider gaps within the stock market it usually leads to uneasiness and has a depreciative impact in most of the entities that are involved. Instability in the capital markets is a result of extreme volatility produced by the stock market, it further goes on to destabilize the value of the currency hampering international trade and finance (Ma & Kao, 1990).

High volatility signifies that security's price can adjust rapidly within a very short period either positively or negatively. On the other hand, lower volatility indicates a less dramatic movement in the value of a security whereby its value changes in a more stable rate over time. The efficient functioning of the stock market is destabilized by extreme volatility (Karolyi, 2001). Ma and Kao (1990) state that a couple of factors do perform a part in the volatility of the stock market regardless of how much the impact is. These factors can majorly be economical or political. In their study, Grouard, Levy and Lubochinsky (2003) suggest that several large shocks affecting the economy, increased unpredictability of macroeconomic and geopolitical developments and investors' increasing doubts about the quality of financial assets against a background of weaker capital structures are the primary causes of recent volatility patterns.

The stock market volatility is usually presented by the index variation that will be achieved from the specific share prices of all the entities that are listed in the stock exchange (Lesmond, 2009). One of the most generally applied measures of volatility is

the standard deviation. In this, skewness, kurtosis and heteroskedasticity become major concerns for investors. Histograms can also be used to represent this volatility (Johnson, 2010).

1.1.3 Selected Macroeconomic Variables and Stock Market Volatility

For quite sometimes, the interconnection amongst stock market volatility and macroeconomic factors have been an area that has gained a lot of scholarly interest. In many cases, conclusions have been made suggesting that certain macroeconomic variables for example GDP, exchange rate and interest rates influences performance of a firm (Gan, Lee & Zhang, 2006). Financial media confirmation indicates that investors usually assume that macroeconomic events and financial rules possess a significant influence on the earning unpredictability. In the same case, the macroeconomic variables environment is found to influence the investors' decisions and trigger numerous scholars in examining the association amongst stock market volatility and macroeconomic variables (Peansupap & Walker, 2005).

The theory of EMH by Fama (1970) contends that in an efficient market, security prices will always be a reflection of all the information available. Investment managers as such therefore ought to react fast and accurately to actual and anticipated macroeconomic variable changes by adapting the said changes or planning for them well in advance. Such prudence assists to assure stock market performance not only in the present but also in future. When the macroeconomic variables changes both threats and opportunities emerges to the industry participants at the same time; the participants that are have made proper preparation for changes are able to take advantage of the opportunities which present themselves therefore improving performance and on the contrast those without

adequate preparation face the threats that adversely affect their financial performance (Gerlach, Peng & Shu, 2005).

McKinnon (1973) in his theory contends that it is important for monitoring macro-economic variables for instance inflation, exchanges rates and real interest rates since they have an influence on the numerous economic fundamentals and consequently affect the economic conditions. For example, they posit that holding the interest rates below market equilibrium increases the investment' demand and not the real investment. Though as indicated by the market efficiency theory, apart from the demand and supply forces no other factor ought to have an influence on the prices of all variables (Fama 2000). As per Fama (2000), when all existing information pertaining the market is shown in the stock prices, it is referred as efficient market. Empirically, Alam and Rashid (2014) explored the connection between Karachi stock market index and macroeconomic variables. The findings established that interest rates, exchange rates and money supply are adversely linked with stock returns while inflation has no statistically significant influence on stock returns.

1.1.4 Nairobi Securities Exchange

NSE was founded in 1954 as an association of voluntary brokers and was registered under the societies Act before its privatization in 1988. To enable live trading, NSE introduced the Automated Trading Systems (ATS) where it served traders on the first come first serve basis. To facilitate the trading of government securities the ATS was connected to the Central Depository System and the CBK. In February 2018, NSE all share Index was announced as way of providing investors with a good measure of performance of the NSE. The NSE has continually had several changes and innovations

not forgetting the removal of the aggregate foreign ownership limit of the NSE listed firms in 2015. Capital Market Authority (CMA) regulates NSE and is also mandated to license it. Listing and prospecting of issued and traded at the NSE is subjected to approval by CMA (NSE, 2018).

Macro-economic variables in Kenya have been changing overtime due to government policies and the law of demand and supply. The banking amendment Act (2016) to cap interest rates was passed into law and this affected the rate at which listed firms can borrow and invest their funds. The set base rate affects the lending interest rates in the economy, and indirectly the foreign exchange rate. Some of the other macro-economic challenges that have affected the sector include; increasing levels of prices, variability in economic growth, money supply movements, increasing external debt and exchange rate variability. In the past number of years, the Kenya shilling has continued to depreciate in comparison to the highly traded currencies in the world on top of the broadening current account deficit. The undesirable macroeconomic issues might lead to great problems in the stock market (CMA, 2018).

In regard to stock market volatility, Nairobi Securities Exchange has experienced periods of high and low returns on shareholders investments since it was constituted in 1954. Among other factors like the prevailing political environments in the economy, macroeconomic factors like inflation and interest rates have been noted to be one of the major causes of variations in stock returns in the NSE. Even though the NSE is in general considered highly liquid market and more active in terms of trades as compared to most of the other markets in the sub-Saharan Africa and East Africa, the high level of volatility is still considered a huge challenge facing the Kenyan securities market with increased

level of volatility specifically experienced in the equity and bonds secondary markets (CMA, 2018).

1.2 Research Problem

The study of macroeconomic variables has drawn various studies which most of them have concluded that fluctuations in the stock market returns continue to be directly interconnected with the various macroeconomic variables. Liu (2013) posits that macroeconomic variables among them exchange rate, interest rate, supply of money, inflationary rate, public debt, current account deficit and economic growth are linearly related to volatility of stocks and therefore an investor must carefully monitor and forecast these variables when making choices with regard to investment decisions. Mehwish (2013) however argue that macroeconomic and financial variables do not contain much information regarding forecasting of volatility of stock market.

The performance of the NSE most often mirror the economic times changes in Kenya. Over the last few years, the NSE performance has been volatile where high performance lasts for a short period before it is interrupted by a declining period. Macro-economic variables are thought to be some of the factors that bring about this volatility in stock market returns. Some of the macro-economic challenges that have affected the sector include; rise in inflation, variability in exchange rates and interest rates unpredictability. Over the last few years the Kenyan currency has been losing value compared to the highly traded currencies in the world in addition to constant fluctuations in money supply. These undesirable macroeconomic issues might lead to great problems in the stock market and that is the motivation for carrying out the current study.

Several studies have undertaken the effect of various macroeconomic variables on the stock market. The vast majority of these studies have however focused on stock market returns which are not synonymous to volatility. In addition, the study findings have been contradictory. Jahur, Quadir and Khan (2014) established that macroeconomic variables for instance the interest rate and the CPI to significantly influence the performance of Bangladesh's stock market performance. A study by Ilahi, Ali and Jamil (2015) in Pakistan, suggested that a weak connection was present amongst the returns of the stock market and macro-economic variables. According to Mehwish (2013), in Pakistan, negative association exists amongst real interest rate and the stock market performance. A study by Liu (2013) in the Chinese market concluded an inverse correlation amongst exchange rate depreciation and the stock market returns.

In Kenya, Kinyanguk (2018) focused on stock market returns and macroeconomic factors and came to a conclusion that balance of payments, economic growth, inflation and exchange rates insignificantly determines the stock market returns at the NSE and on the contrast money supply together with interest rate are significant. On the contrary, Ouma and Muriu (2014) in their studies revealed that changes in exchange rates, inflation and money supply affects the stock market in Kenya. Mwai (2013) noted the effects on the share prices led by certain macroeconomic variables including interest rates, GDP, inflation and exchange rates. Mbaabu (2018) found that interest rates, inflation rate, government expenditure and balance of payment have a positive correlation with stock market volatility while economic growth has a negative correlation. This view is opposed by Kiberenge (2019). While Ngunjiri (2018) posits that money supply and interest rates have no substantial impact on stock market returns, Kinyanguk (2018) posits otherwise.

From the foregoing, the results of previous studies in this area are contradicting therefore need for a further study. More so, the previous studies in the Kenyan context have considered stock market returns without addressing the volatility aspect and this was the gap the current study intended to fill by responding the research question: What is the effect of selected macroeconomic variables on stock market volatility at the NSE?

1.3 Research Objective

This study sought to determine the effect of selected macroeconomic variables on stock market volatility at the NSE.

1.4 Value of the Study

The findings will provide background information to the investors on how to ascertain the effect of macro-economic factors on their investment. This allows them to give attention to the variables and be in a position to diversify risks while investing at the stock market. Knowledge of such provides a competitive advantage to the investors in form of better information on the best investment decisions. Future investors can use this study as a foundation upon which they can gauge how the prevailing economic situation will impact on their investment choices.

The findings will be beneficial to scholar, future researcher and academicians who wish to undertake related or similar studies will find this study beneficial. In addition the findings will benefit researchers and scholars in identifying related fields of research by citing topics requiring additional empirical studies to determine study gaps.

To policy makers for instance the CMA, the government and the NSE, the study will be beneficial as they could use the findings and recommendation to develop vital policies for

mitigating the effects of macroeconomic factors in the country on stock market returns at the NSE.

The study will also aid in development of theory. There are the theoretically expected association amongst the selected stock market volatility and macro-economic variables this study will either confirm or disapprove the held hypothesis and in so doing help in development of theory in this area.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The main idea of this chapter is to review theories that are the basis of the study. More so, the chapter discusses the prior empirical studies done pertaining to the research topic and areas related to it. Additionally, the chapter contains other sections which elaborates on the determinants of stock market volatility, shows the conceptual framework which illuminate on the study variable relationships, study gap and finally a literature summary.

2.2 Theoretical Framework

Theoretical framework reviews the theories relevant to the present study. The theoretical reviews covered are; EMH, arbitrage pricing theory and the modern portfolio theory.

2.2.1 Arbitrage Pricing Theory

This theory was pioneered in 1976 by Ross. The theory presumes that returns of a given instrument are affected by different economic variables by their impact on future discount rates and dividends (Shrestha & Subedi, 2015). APT correlates with market portfolio concept, as per the theory, based on individuals' specific systematics risk, they exhibit different portfolio of investments. The APT is a multifactor model and most of the empirical literature argues that APT compared to CAPM has better results proposition, since it uses multiple factors for demonstrating shared and systematic risk (Waqar & Mustabsar, 2015).

The theory established a theoretical framework that links share returns with some variables that have the potential to influence sources of income volatility (Subedi &

Shrestha, 2015). APT uses macro-economic variables to determine asset prices and the theory assumes that various macro-economic variables can actually affect asset prices other than systematic risk beta (Waqar & Mustabsar, 2015).

Some of the macro-economic parameters that impact asset prices of financial instruments include: the gross national product, government internal borrowing, inflationary rates, balance of payments, investor confidence levels, prevailing levels of unemployment, changes in expected returns on securities and changes in the interest yield curve (Amarasignhe, 2015). Based on this linear correlation between the equity prices and macro-economic variables, it can be purported that macroeconomic variables have impact on the value of securities. Consequently, the volatility of the asset or security can be labelled as the gross of the expected return and any unexpected returns on the asset due to macro-economic variables variations.

2.2.2 Efficient Market Hypothesis

Efficient Market Hypothesis (EMH) was propagated classically by Roberts (1967) and Fama (1970). They argued share prices show all the obtainable and relevant info hence always fairly priced, no investor can earn abnormal returns in the marketplaces minus captivating on added risks, Malkiel (2003). This theory makes an assumption that the markets are rational and that there is no single irrational participant. Fama (1970) categorizes the forms of market efficiency into three; strong, semi-strong and weak form efficiencies. The weak form market efficiency denotes info on stock costs and volume figures are all showed in the current stock costs. "Semi-strong" form incorporates openly existing info into security prices in addition to the information on costs and volume figures. "Strong form" market efficiency incorporates private information in the stock

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prices; thus, an investor cannot as well use private information to earn abnormal returns. More recently however, a new breed of economists has come to consider prices of stock are to some degree probable established on historical stock price arrays and necessary valuation parameters.

The opponents of EMH further argue psychological, behavioural, and additional factors such as size and time of the year have been explained to influence movement of stock values. Kahneman and Tversky (1973) published several studies in this field with most of the works focusing on various psychological concepts relating to behaviour in finance. They introduced the availability of cognitive biases and heuristics, which affects people to engage in conduct, which is irrational and unanticipated. Thaler (1980) followed on the prospect theory as done by Kahneman and Tversky (1973) and argued being situations in which customers act in an inconsistent manner with economic theory. Thaler (1980) realized that psychological theory rather than conventional economics could help account for the irrationality. Several instances in recent financial markets history show proof stock prices could not be set by balanced stock market behaviour but rather out of psychological considerations. An example is the stock market crash of October 1987 and the internet bubble of the late 90s and early 2000s

This theory will be relevant for the current study, as it will enable the researcher to know how the security prices guarantee investments in the market. It will also give the researcher precise information of the type of the market whether in any of the three forms and the various price security associated with them. In a weak-form capital market, share prices should reflect the past information. Thus, investors should not utilize earnings yield, which entails past information, to predict the stock returns.

2.2.3 Modern Portfolio Theory

Markowitz (1952) invented the theory on his write up for portfolio mixture. This theory put emphasis of maximization of expected returns through forming portfolios that have well managed risk levels. Markowitz contended that a firm can come up with a portfolio that will yield the highest expected returns at a risk level that is manageable. Mainly in this theory, the main idea is aimed on generating maximum profits in a specified portfolio risk or rather reducing risk in a specific level of anticipated returns through prudently choosing a proportion of various investment that yields the least risk and produces highest returns (Fabozzi, Gupta, & Markowitz, 2002).

This theory identified two types of risks which investors need to be conscious of, that is, a systematic risk and unsystematic risks. Systematic risk is inherent in the volatility of the entire market or some part of it, while unsystematic risk is associated with the extent to which an individual investment is volatile. Investors are therefore instructed to combine portfolios by guaranteeing that, specific risk carried by that specific investment in the portfolio is offset by a lower specific risk in another investment (Cuthbertson, 2004).

According to Brueggeman and Fisher (2011), macroeconomic variables generally influence the business environment within the economy. An environment of volatile economic variables including inflationary pressures and volatile exchange rates, infer that returns to businesses, firms and listed firms in particular shall fluctuate. Unstable returns therefore dominate. Returns of listed firms in such environments fluctuate thus affecting their returns and stock market volatility. Policy makers should thus be keen on macro-economic variables as they can have an impact on stock market volatility.

2.3 Determinants of Stock Market Volatility

Stock market volatility is an area of immeasurable significance to the stock market investors reason being it directly impacts their wealth. Following are factors perceived to play quite a significant role in the general stock volatility.

2.3.1 Economic Growth

When an economy is growing a positive GDP is reported and this increases loan demand (Osoro & Ogeto, 2014). An increment in economic output might increase the anticipated cash flows and thereby prompting an improvement in stock market returns and on the other hand the recession period a reverse impact is reported (Kirui et al., 2014). From the prior empirical studies, it is noted that the financial systems of developed counties have more efficiency (Beck et al., 2003). There is in addition a positive association of monetary policies, fiscal policies and economic stability with stock market development. Stock market are more advanced in countries with high income in comparison with countries that have low income (Cull, 1998).

In most case, investors are more worried with GDP reports because this measurement is able to communicate the overall health of the economy. The long term effect of a healthy economic growth is improving performance of corporates in terms increased profits, improvement of stock market returns which results to long term growth whereas short term effect is market trends that are unpredictable even in times of positive economic growth (Beck et al., 2003).

2.3.2 Interest Rate

The interest rate serves as an income function and it mainly helps in the mobilization of financial resources and ensures efficient resource utilization so as to bring economic

development (Osoro & Ogeto, 2014). The annual price charged on a borrower by a lender so as to avail loans to the borrower in form of the percentage of the sum of the loaned amount is called the interest rate. The neo-classical theory of interest rate suggests that, the loans' investment cost for the business persons becomes costly when the interest rates increase leading to a shrink in the investment opportunities in an economy (Barnor, 2014).

The neoclassical theory that explains rates of interest states that, the loans' investment cost for the entrepreneurs becomes expensive when the interest rates increase leading to a shrink in the investment opportunities in an economy (Barnor, 2014). The rate of interest is assumed to be the capital cost and the decisions of investors are influenced by changes in interest rates (Olweny & Omondi, 2010). Rehman, Fauziah and Sidek (2009) state that increased discount rates and interest rates will lower the cash flows' present value leading to increased opportunity costs of holding cash, the interest rates level, which finally results to stocks being substituted for bonds.

2.3.3 Inflation Rate

Tucker (2007) in his works describes inflation as the universal rise in the general price of goods or services in an economy. Inflation does not refer to an increase in a unit price of a good or a service but denotes the overall rise of average price level. Sloman and Kevin (2007) in their research paper expound that inflation can take different forms either a demand pull inflation which is as a result of increased demand of goods or cost push inflation. When there is general rise in demand for goods consequently causing the prices to increase and results to a certain degree increasing the exports in an economy that is referred as demand-pull inflation. In contrast, an increment in the production cost leads to

cost push inflation which makes firms shift the increase in cost to customers by charging more (Hendry, 2006).

As a result of high inflation rates there are higher prices that are likely to slow down business and decrease earning for companies. Interest rates also tend to rise as result of high prices. Fama (2000) argued that real economic activity is negatively correlated to inflation that would consequently positively relate to the performance of a market. Therefore, the stock index ought to correlate with the expected inflation negatively, and with short term interests acting as a substitution same to the IFE.

2.3.4 Exchange Rates

Investors base their investment in a foreign currency on the premise that it will appreciate in value in comparison to other currencies. When an economy is anticipated to pull back, its currency lean towards depreciation. In the year 2010 when there was a European Debt crisis, a number of countries in the European Union with debt obligations faced the risk of default and hence the European economic growth was in question. The resultant effect on the Euro was a drop, while the investors focused on acquiring other currencies (Johnson, 2010).

Dwivedi (2002) suggests that heavy technological advancement among industrialized nations is the cause of foreign exchange volatility. He mentions that the level of production has exceeded their consumption ability. Consequently, there is an increment in the export volumes from these nations, thereby increasing foreign currency supply in the domestic country resulting to loss of value of their currency; the resultant effect

would make exports expensive and the value would fall. Certain currencies are considered to hold more risk than others more so, those of developing countries.

2.3.5 Money Supply

Money supply entails a country's legal tender together with all other liquid instruments in circulation within the economic at specified duration of time. It would comprise of the money in different forms such as notes and coins, cash and bank balance in current and saving accounts as well as short-term investments. Money supply affects a country's economy largely and it is therefore imperative for a monetary authority to ensure there is regulation of the amount circulating by implementing monetary policies (Osamwonyi, 2003).

Tobin (1969) discovered a clear connection of the variations amongst the monetary policy and the stock market. The study stressed on significance of stock returns as a linkage of the economic effects. A strong linkage of stock returns and economy was revealed. Additionally, Tobin discovered that there emerged deficits in budgets due to growth in money supply that consequently influenced the stock returns.

2.3.6 External Debt

The economic theory states that, government external debt is beneficial for the economic growth of a country which subsequently impacts the different sectors making up the economy. This is possible only up to a selected level after which the effects become adverse to the economy. The theory of debt overhang by Krugman (1988) clearly shows how an accumulation of high public debt lowers the investment level which translates to low economic growth of a country.

Krugman (1988) states that debt overhang is a situation in which the existing external debt is very large. According to the theory, foreign investors will be kept from investing in a country with massive external debt because part of their proceeds would be utilized in servicing the debt through increased taxes. Alternatively, the theory states that lowering the debt obligation would raise both domestic and foreign investments thereby minimizing the likelihood of default.

2.4 Empirical Review

A few empirical studies exist internationally and locally in support of this current study; however, these studies have contradicting findings leaving research gaps.

2.4.1 Global Studies

Alam and Rashid (2014) explored the association amongst Karachi stock market index and macroeconomic variables. Johnson Cointegration test, Augmented Dicky Fuller and Phillip Perron tests evidenced the presence of heteroscedasticity in the data. The association between stock returns and the variance of the squared error was established using the Generalized Autoregressive Conditional heteroskedasticity (GARCH) since a heteroskedastic trend was present in the data. The findings established that macroeconomic variables for instance exchange rates, CPI, money supply and interest rates proved to be negatively linked with the stock returns while industrial production index was established to have a positive association with stock returns. All the variables except inflation had a significant relationship with stock market returns.

Ilahi, Ali and Jamil (2015), examination concentrated on the relative relationship which was there between on the Pakistan's macroeconomic variables on stock market returns. The Pakistan Karachi stock exchange 100 index was applied as a representation of the

connection amongst stock market returns and exchange rate, the interest rate and inflation rate representing the macroeconomic variables. Secondary data was collected spanning period 2007 to 2012. Using multiple linear regression for data analysis a weak association between the stock returns and the macro economic factors was established.

Pinjaman and Aralas (2015) explored the impacts that chosen macroeconomic variables had on the Malaysian stock return instability. The selected variables comprised of inflation rates, GDP, exchange rates, interest rate, financial crisis, money supply as well as economic liberalization. The dynamic stock results, instability assessment perceived that stock return shakiness is consistent in character where the previous instability will control the current stock returns. Cross-sectional time series model was used for analysis. It was found out that a significant relationship between GDP, interest rate, money supply, exchange rate, inflation rate, financial crisis and economic liberalization and stock return instability existed.

Kotha and Sahu (2016) analyzed both the long run and the short run association amongst select macroeconomic factors and the Indian Stock Market. Selected macroeconomic factors included exchange rate, T-bill rates, money supply and wholesale price index. The study applied error correction and co-integration model (ECM) to analyze data from July 2001 to July 2015. The study un covered the presence of long run relation amongst the BSE Sensex and the selected macroeconomic indicators.

Badullahewage (2018) endeavored to examine how the Sri Lanka stock market performance is affected by macroeconomic factors. The variables of macroeconomic embraced in this study were exchange rates, GDP, money supply, inflation and interest rates. The span of the study was 1990 t0 2014 in which secondary data was used an

analyzed so as to find the association amongst the variables. From the outcomes it was revealed that the stock market and the macroeconomic variables have a strong association. It was uncovered that exchange rates together with inflation were factor having a relatively higher impact on the stock market.

2.4.2 Local Studies

Mbaabu (2018) looks at the impact of chosen macroeconomic variables on the volatility of stock returns at the NSE. The variables that were studied included economic growth, commercial banks' interest rates, inflation rate, government expenditure and balance of payment position. Quarterly data was used for ten years from the year 2008 to 2018. A linear regression model was undertaken in analyzing the data and determine whether there exist any significant influence to stock volatility by macroeconomic variables. The outcomes revealed that the connection amongst economic growth and stock volatility was negative with the other macroeconomic variables exhibiting positive correlation amongst the variables on stock volatility.

Mwangi (2018) needed to determine the influence of exchange rate movement on stock market volatility at the NSE. 10 years monthly secondary data was acquired for years 2007 to 2017. Analysis was achieved using multiple regression model in order to establish the connection amongst the variables while descriptive research design was adopted. The findings revealed that individually, interest rate was insignificant stock market volatility determinants while exchange rates and inflation significantly are stock market returns determinants at the NSE.

Ngunjiri (2018) aimed on examining how stock market was affected by macroeconomic variables at the NSE. This study scope was ten years ranging from 2008 to 2018 on a

quarterly basis. Secondary data was used and collected for the same period and included data on exchange rates, inflation, money supply, treasury bill rate and the NSE 20 share index. In analyzing the data several models were used including multiple linear regression, correlation analysis and Granger causality tests. According to the outcomes of Granger causality test it was established that there was no causality between the stock return and the variables on macroeconomic used in this investigation. More so it was uncovered that inflation had a negative and significant relation with stock market returns as per the linear regression and correlation findings.

Kinyanguk (2018) aimed on determining the effect that macroeconomic variables had on stock market returns. The span of the study was 20 years ranging from 2008 to 2017 where secondary data was acquired after which it was analyzed using multiple linear regression in order to establish the association of the variables. The study embraced a descriptive study. The findings uncovered that inflation, exchange rates, economic growth and balance of payment were not significant in determining the stock market returns and in the contrast interest rates and money supply were significant in determining the stock market returns.

Kiberenge (2019) attempted to find out how stock inflation affected returns at the NSE. Inflation was the predictor variable. Control variables were interest rates, rate of unemployment and economic growth. Stock market returns was the response variable. Secondary data was gathered for 10 years (2009 to 2018) on a quarterly basis. For analysis of the linkage between the variables, a descriptive research design was applied and a multiple linear regression model. Results indicated that inflation, economic growth, interest rates and rates of unemployment were statistically significant in establishing

stock market returns. The rate of unemployment as well as inflation rate had a negative influence whereas economic growth and rates of interest had a significant positive effect.

2.5 Conceptual Framework

The model depicted shows the hypothesized association amongst selected macro-economic variables and stock market volatility. From the model, it can be concluded that economic growth represented by quarterly GDP growth rate, interest rate represented by the quarterly average bank lending rate, inflation rates as given by quarterly CPI, exchange rate as represented by quarterly exchange rate amongst KSH/USD, money supply operationalized as M2 and external debt operationalized as the standard deviation of quarterly external debt influence stock market volatility measured by the standard deviation of NASI.

Independent variables   **Dependent variable**

Economic growth
  - GDP growth rate

Interest rates
  - Banks' lending rate

Inflation
  - CPI

Exchange rates
  - KSH/USD

Money supply
  - M2

External debt
  - External debt

Stock market volatility
  - Standard deviation of NASI
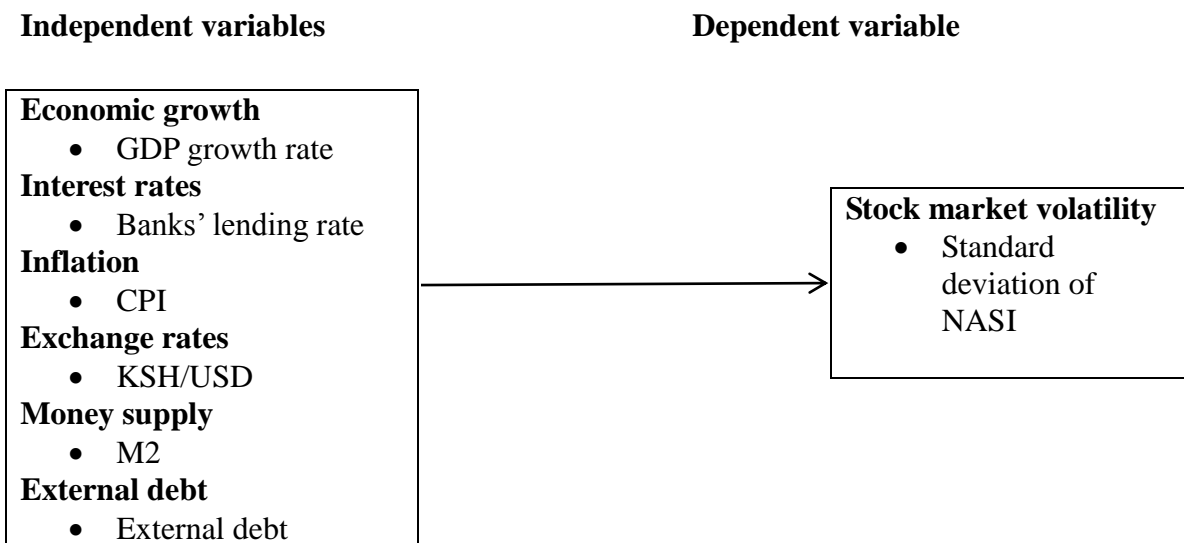
Figure 2.1: Conceptual Model

Source: Researcher (2020)

2.6 Summary of the Literature Review

There are a few theoretical frameworks which have expounded on the theoretically anticipated relationship amongst stock market volatility and macro-economic variables.

The theories covered in this review are; APT, EMH and MTP. Additionally, main stock market volatility influencers have been looked into in this chapter. More so, a few empirical studies done not only locally but also globally on macro-economic variables and stock market volatility have been deeply examined. The findings of the foresaid studies also have been explored. Lastly, the chapter has provided the conceptual framework showing the hypothesized connection amongst the study variables and the research gaps that the study will leverage on.

Although there are several empirical studies conducted amongst macro-economic variables and stock returns stock volatility and stock market performance, the results however have been inconsistent. Mbaabu (2018) found that interest rates, inflation rate, government expenditure and balance of payment have a positive correlation with stock market volatility while economic growth has a negative correlation. This view is opposed by Kiberenge (2019). While Ngunjiri (2018) posits that money supply and interest rates have no significant influence on stock market returns, Kinyanguk (2018) posits otherwise. The lack of consensus among the previous researchers is a justification good enough to warrant further studies in this area. More so, the previous studies in the Kenyan context have considered stock market returns without addressing the volatility aspect and this was the gap the current study intended to fill by responding to the research question: What is the effect of selected macroeconomic variables on stock market volatility at the NSE?

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter is composed of a number of sections that explain the way the research was conducted to completion. The sections include; the research design, the population to be studied, the data to be collected and the means to collect it, the diagnostic tests to be employed and finally the techniques of analyzing the data.

3.2 Research Design

Descriptive design was embraced in this study. A descriptive study aims at finding out the what, where and how of a condition (Cooper & Schindler, 2008). The reason for utilizing the design is because of the keenness by the researcher in discovering the situation as it is (Khan, 2008). The fact that the researcher of this study has insight on the area under examination but seeks more knowledge regarding the relationship between the variable being studied make this research design suitable. Moreover, descriptive research purposes of issuing an authentic and correct representation of the variables being studied and this assist in getting response to the research question (Cooper & Schindler, 2008).

3.3 Data Collection

Secondary data solely was utilized in this study. The data was extracted from the published annual reports. The dependent variable was stock market volatility which was obtained from quarterly standard deviation of the NASI share index. Data on foreign exchange rate was the rate of Kenya shilling to the United States Dollar since it is most traded currency and it was collected from CBK. Data on interest rates which was average

bank lending rate, quarterly external debt and money supply represented by M2 were also collected from the central bank while data on inflation given by CPI and economic growth as measured by growth rate of GDP were acquired from the Kenya National Bureau of Statistics (KNBS). The data was collected for ten years from January 2010 to December 2019 on a quarterly basis.

3.4 Diagnostic Tests

In determining the viability of the study model, the paper carried out several diagnostic tests, which included normality test, stationarity test, test for multicollinearity, test for homogeneity of variances and the autocorrelation test. Normality tests the presumption that the residual of the response variable have a normal distribution around the mean. The test for normality was done by the Shapiro-wilk test or Kolmogorov-Smirnov test. In the case where one of the variables was not normally distributed it was transformed and standardized using the logarithmic transformation method. Stationarity test was used to assess whether statistical characteristickslike variance, mean and autocorrelation structure vary with time. Stationarity was gotten using augmented Dickey Fuller test. In case, the data fails the assumption of stationarity, the study used robust standard errors in the model (Khan, 2008).

Autocorrelation measures how similar a certain time series is in comparison to a lagged value of the same time series in between successive intervals of time. This was measured by the Durbin-Watson statistic and incase the assumption was violated the study employed robust standard errors in the model. Multicollinearity occurs when an exact or near exact relation that is linear is observed between two or several predictor variables. Variance Inflation Factors (VIF) and the levels of tolerance were used. Any multicolinear

variable should be dropped from the study and a new measure selected and substituted with the variable which exhibits co-linearity. Heteroskedasticity tests if the variance of the errors from a regression is reliant on the independent variables. The study assessed for heteroskedasticity using the Levene test and incase, the data fails the assumption of homogeneity of variances the study used robust standard errors in the model (Burns & Burns, 2008).

3.5 Data Analysis

Following data collection from the various sources, it was arranged in a way that aided in achieving the research objectives. To enable the data analysis, the researcher made use of a software namely the SPSS version 23. Inferential as well as descriptive statistics were conducted. For descriptive statistics, the measure of central tendency, dispersion and skewness were computed for all the variables individually and on overall. For inferential statistics, the researcher ran both correlation and regression analysis. The purpose of correlation analysis being determination of the degree of relationship amongst the study variable whereas regression analysis was used for ascertaining both the effect and cause amongst the dependent and independent variables.

3.5.1 Analytical Model

Using the collected data, regression analysis was conducted in determining the magnitude of the association amongst selected macro-economic variables and stock market volatility. The study applied the following multivariate regression model;

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Where: Y = Stock market volatility as measured by the quarterly standard deviation of the

Nairobi All Share Index (NASI)

α =y intercept of the regression equation.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ =are the regression coefficients

X_1 = Economic growth as measured by quarterly standard deviation of the GDP growth rate.

X_2= Interest rates as measured by the quarterly standard deviation of the banks average lending rate

X_3= Inflation rate given by quarterly standard deviation in CPI

X_4= Exchange rate for Ksh against the US Dollar given by the quarterly standard deviation

X_5= Money Supply as measured by standard deviation of M2 on a quarterly basis

X_6= External debt as measured by standard deviation of external borrowings on a quarterly basis

ε =Error term

3.5.2 Tests of Significance

For reason of establishing the statistical significance of the individual parameters and overall model the research conducted parametric tests. The F-test was applied in determination of model's significance and this was availed from the Analysis of Variance (ANOVA) whereas the significance of the individual variables was achieved by carrying out a T-test.

CHAPTER FOUR

DATA ANALYSIS, RESULTS, FINDINGS

4.1 Introduction

The chapter represents the study results and findings based on the study's objectives. It also gives an analysis of the data collected from CMA, CBK and KNBS to determine how selected macro-economic variables on stock market volatility at the NSE. By use of descriptive statistics, correlation and regression analysis, the study results were illustrated in tables to simplify the interpretation.

4.2 Descriptive Analysis

Descriptive statistics indicates the mean, maximum and minimum values of variants which are used with their standard deviations for this work. The illustration below is the presentation of the statistics for the study variables. Analysis of the variants under study was produced by the SPSS software within ten years (2010 to 2019) basis, every three months.

Table 4.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NASI	40	71.5	184.5	142.028	25.8060
Interest rate	40	5.833	18.000	9.58540	2.884208
Exchange rate	40	75.138	103.518	90.83655	9.511763
Inflation rate	40	4.033	16.833	8.07400	3.606442
Economic growth	40	.092	.123	.10823	.008166
Money supply	40	8.7	9.4	9.185	.1331
External debt	40	15.613	13.945	14.845	.7538
Valid N (listwise)	40				

Source: Research Findings (2020)

4.3 Diagnostic Tests

Diagnostic tests were carried out before the regression model was run. In this case, the tests conducted were Multicollinearity test, normality test, autocorrelation and Heteroscedasticity tests.

4.3.1 Multicollinearity Test

Multicollinearity can be defined as a statistical situation in which several predictor variables in a multiple regression model have a high correlation. The situation is unwanted where there exists a strong correlation among the predictor variables. A combination of variables is said to be perfectly multicollinear in case there is one or more exact linear relationship among a number of the variables.

Table 4.2: Multicollinearity Test

Variable	Collinearity Statistics	
	Tolerance	VIF
Economic growth	0.376	2.660
Interest rates	0.360	2.778
Inflation rate	0.392	2.551
Exchange rate	0.372	2.688
Money supply	0.384	2.604

Source: Research Results (2020)

VIF value was utilized in the study where a value lower than 10 for VIF meant lack of multicollinearity. For multiple regressions to be useful, the variables should exhibit a weak relationship. The variables in the study showed a VIF value of <10 as shown on Table 4.2 which could be interpreted to mean that the variables had no statistical significant Multicollinearity among them.

4.3.2 Normality Test

To test for normality, the researcher used the Shapiro-Wilk test and Kolmogorov-Smirnov tests. The null and alternative hypotheses are as shown below.

H_0: the secondary data was not normal.

H_1: the secondary data is normal

A p-value greater than 0.05, would lead the researcher to reject the null hypothesis and vice versa. The test results are illustrated in table 4.3.

Table 4.3: Normality Test

NASI	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Economic growth	.165	40	.300	.880	40	.784
Interest rate	.149	40	.300	.857	40	.853
Exchange rate	.156	40	.300	.906	40	.822
Inflation rate	.172	40	.300	.869	40	.723
Money supply	.174	40	.300	.890	40	.728
External debt	..169	40	.300	.848	40	.724

a. Lilliefors Significance Correction

Source: Research Findings (2020)

The data revealed a p- value more than 0.05 hence the researcher used only the alternative hypothesis and concluded that the data used in the research was evenly distributed. This data was used to conduct parametric tests and statistical analyses like Pearson's correlation, regression and ANOVA.

4.3.3 Autocorrelation Test

Correlation of error terms in varying time periods were checked by conducting a serial correlation test. The Durbin Watson test for serial correlation was used to assess for autocorrelation in the linear panel which is a major challenge in panel analysis of data and it has to be accounted so as to get right model specifications. Below are the results

Table 4.4: Autocorrelation Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.981ᵃ	.962	.956	5.3980	1.837

a. Predictors: (Constant), money supply, Interest rate, Exchange rate, Inflation rate, Economic growth, External debt
b. Dependent Variable: NASI

No autocorrelation is present according to the null hypothesis. The Durbin Watson statistic of 1.837 is between 1.5 and 2.5 implying that serial correlation doesn't exist.

4.3.3 Heteroskedasticity Test

It checked for heteroskedasticity by use of Likelihood Ratio (LR) as indicated in the Table. This test used the alternative hypothesis that the error was homoscedastic. A chi-square value of 32.12 was produced by the likelihood-ratio test with a 0.0000 p-value. The chi-square esteem was significant at 1 percent level.

Table 4.5: Heteroskedasticity Test

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

chi2(1)   =   32.36
Prob > chi2 = 0.0000

4.4 Correlation Analysis

This was done to determine associations amongst stock market volatility at the NSE and the variables for this research (economic growth, rates of interest, inflation and exchange rates, money supply and external debt). Findings show, a weak but positive and statistically unsubstantial correlation ($r = .254$, $p = .104$) between interest rate and stock market volatility. Economic growth, money supply and exchange rates have a positive and substantial connection with stock market volatility at the NSE as showed by ($r =$

.932, p = .000); (r = .670, p = .000) and (r = .850, p = .000) respectively. Inflation showed a negative correlation with stock market volatility at the NSE and the relationship was significant as shown by a p value of -0.543 which is lower than significance level of 0.05. External debt however did not have a significant association with stock market volatility.

Table 4.6: Correlation Analysis

		NASI	Interest rate	Exchange rate	Inflation rate	Economic growth	Money supply	Debt
NASI	Pearson Correlation	1						
	Sig. (2-tailed)							
Interest rate	Pearson Correlation	.254	1					
	Sig. (2-tailed)	.114						
Exchange rate	Pearson Correlation	.850**	.244	1				
	Sig. (2-tailed)	.000	.129					
Inflation rate	Pearson Correlation	-.543**	.556**	-.356*	1			
	Sig. (2-tailed)	.000	.000	.024				
Economic growth	Pearson Correlation	.932**	.211	.507**	-.436**	1		
	Sig. (2-tailed)	.000	.191	.000	.005			
Money supply	Pearson Correlation	.670**	-.102	.382*	-.669**	.527**	1	
	Sig. (2-tailed)	.000	.532	.015	.000	.000		
Debt	Pearson Correlation	.012	-.134	.234	-.278	.178		
	Sig. (2-tailed)	.844	.522	.564	.117	.567		1

**. Significant correlation at 0.01 level (2-tailed).
*. Significant correlation at 0.05 level (2-tailed).
c. Listwise N=40

4.5 Regression Analysis

Stock market volatility at the NSE was regressed against six predictor variables; economic growth, rates of interest, inflation rate, exchange rates, money supply and

external debt. It was carried out at 5% level. The summarized statistics are illustrated in 4.7 below.

Table 4.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.981[a]	.962	.956	5.3980	1.837
a. Predictors: (Constant), money supply, Interest rate, Exchange rate, Inflation rate, Economic growth, external debt					
b. Dependent Variable: NASI					

Source: Research Findings (2020)

Based on the results on table 4.7 above, R square value was 0.962, a revelation that 96.2% of the deviations in stock market volatility at the NSE is caused by variations in exchange rate, inflation rate, economic growth, interest rate, money supply and external debt. Additional variables outside the model explain the 3.8 percent of the variations in stock market volatility at the NSE. Additionally, the results showed strong relation amongst the chosen predictor variables and the stock market volatility as indicated by the correlation coefficient (R) of 0.981. A durbin-watson statistic of 1.837 showed that there was no serial correlation of the variable residuals since it gave a value greater than 1.5.

Table 4.8: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	24981.282	6	4996.256	171.468	.000[b]
1	Residual	990.698	33	29.138		
	Total	25971.980	39			
a. Response Variable: NASI						
b. Predictors: (Constant), Money supply, Interest rate, Exchange rate, Inflation rate, Economic growth, external debt						

Source: Research Findings (2020)

The value is 0.000, lower than p=0.05. This shows the model significantly showed how economic growth, inflation rate, rates of exchange, interest rate, money supply and external debt affected stock market volatility of the listed firms at the NSE.

Coefficients of determination reflected the movement of the relationship between economic growth, inflation rate, exchange rates, interest rates, money supply, external debt and stock market volatility at the NSE. The p-value under sig. column indicated how significant the relationship was. At 95% confidence level, a p-value lower than 0.05 is an indication of statistical significance. The table 4.9 following exhibits the resuts.

Table 4.9: Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	-313.196	92.935		-3.370	.002
	Interest rate	2.989	.482	.334	6.202	.000
	Exchange rate	.223	.228	.082	.978	.335
1	Inflation rate	-2.629	.494	-.367	-5.318	.000
	Economic growth	1.101	286.750	.556	6.131	.000
	Money supply	.832	10.247	.133	2.521	.017
	External debt	-.205	.151	-.095	-1.851	.067
a. Response Variable: NASI						

The above results prove that interest rate, inflation rate, economic growth and money supply substantially determine stock market volatility as evidenced by p values lower than 0.05. Exchange rate is an unsubstantial determinant of stock market volatility as evidenced by a p value that is greater than 0.05.

The equation was as below:

$Y = -313.196 + 2.989X_1 - 2.629X_2 + 1.101X_3 + 0.832X_4$

Where,

Y = Stock market volatility at the NSE

X_1 =Interest rate

X_2 = Inflation rate

X_3 = Economic growth

X_3 = Money supply

On the above model, the constant = -313.196 means that if chosen independent variables (rate of interest, exchange rate, inflation rate, economic growth, money supply and external debt) were rated zero, stock market volatility would be -313.196. Interest rate rise by a unit would increase stock market volatility by 2.989 while a unit increase in inflation rate would lower stock market volatility by 2.629. A unit increase in economic growth and money supply would cause an increase in stock market volatility by 1.101 and 0.832 respectively.

4.6 Discussion and Interpretation of Research Findings

The researcher intended to establish the influence of selected macro-economic variables on stock market volatility at the NSE. The independent variables were interest rates, exchange rates, inflation rate, economic growth, money supply and external debt. Stock market volatility was the response variable that was the main scope of the study and was given by quarterly volatility in the returns of the NASI. The effect of every predictor variables on the response variable was analyzed based on strength and direction.

The correlation coefficients showed a weak positive and statistically unsubstantial correlation between the variables (r = .254, p = .104) between interest rate and stock market volatility. Economic growth, money supply and exchange rates showed a positive

and significant relation with stock market volatility at the NSE as supported by ($r = .932$, $p = .000$); ($r = .670$, $p = .000$) and ($r = .850$, $p = .000$) respectively. Inflation showed a negative association with stock market volatility at the NSE and the relationship was significant as shown by a p value of -0.543 that is less than 0.05 significance level. External debt was however not a significant variable as shown by a high p value.

The model summary showed that the predictor variables: rates of interest, exchange and inflation, economic growth, money supply and external debt explains 96.2% variations in the dependent variable as depicted by the R^2 value suggesting that the model excludes other factors that explain the 3.8% of variations in stock market volatility at the NSE. The significance of the model was obtained at 95% level of confidence because the F-value of 171.468 is more than the critical value. This has the implication that the model is statistically significant, hence its appropriateness in being used in predicting the volatility of stock market at NSE.

The results are partly in agreement with Kithome (2017) who wanted to inspect the effect of foreign exchange rate on stock market returns at the NSE. Interest rate was used as the independent variables represented by monthly lending rate by CBK, inflation rates represented by monthly CPI and lastly exchange rates represented by monthly exchange rate amongst KSH/USD. Stock market return was calculated as monthly returns derived from the 20 share index. The results discovered that individually, exchange rates and inflation are statistically substantial determinants of the stock market returns at NSE, on the contrast interest rate was shown to be insignificant determinant.

This study is also partly in agreement with Badullahewage (2018) who endeavored to examine how the Sri Lanka stock market performance is affected by macroeconomic

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factors. The variables of macroeconomic embraced in this study were exchange rates, GDP, money supply, inflation and interest rates. The span of the study was 1990 t0 2014 in which secondary data was used an analyzed so as to find the association amongst the variables. From the outcomes it was revealed that the stock market and the macroeconomic variables have a strong association. It was uncovered that exchange rates together with inflation were factor having a relatively higher impact on the stock market

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this section, summarized findings from the previous section is provided, conclusions are derived, limitation that were encountered on the overall study explained. Additionally, this chapter gives recommendation to decision maker as well as the policy makers. Finally, the researcher offers suggestions on areas that can be covered by other scholars in further research studies.

5.2 Summary of Findings

The intention of the study was to assess the effect of selected macro-economic variables on stock market volatility at the NSE. The predictor variables used were interest rates, exchange rates, inflation rate, economic growth, money supply and external debt. A descriptive design was chosen for the study. Secondary data sourced from CBK, CMA and KNBS was used and analysis made by SPSS software version 23. Quarterly data over ten years from January 2010 to December 2019 was obtained.

Correlation showed a weak positive and statistically insignificant correlation between interest rate and stock market volatility. Economic growth, money supply and exchange rates exhibited a positive and significant relation with stock market volatility at the NSE. Inflation rate was negatively correlated with stock volatility at the NSE and the relationship was significant. External debt was however found not to have a significant association with stock market volatility.

The co-efficient of determination R^2 was 0.962 which can be translated to mean that 96.2% of the variations in volatility are attributable to the six chosen predictor variables

while 3.8% in the variation of stock market volatility is caused by factors beyond the scope of this study. It was also discovered that the predictor variables had a strong correlation with stock market volatility at the NSE (R=0.981). ANOVA results revealed a significant F statistic at 5% level with a p=.000. Hence adequacy of the model in explaining how the selected variables relate.

The findings from the regression indicate that when the chosen predictor variables (interest rate, exchange rate, inflation rate, economic growth, money supply and external debt) were rated zero, stock market volatility would be -313.196. An increment of interest rate with a unit would cause a rise in stock market volatility by 2.989 whereas increment in inflation rate with a unit would cause a decrease in stock market volatility by 2.629. An increment in economic growth with a unit and money supply would cause a rise in stock market volatility by 1.101 and 0.832 respectively.

5.3 Conclusion

From the results, interest rate was discovered to be positively related with stock market volatility at the NSE and hence an increase in interest rates raises stock market volatility at the NSE. It also showed a positive influence of economic growth on stock market volatility and henceforth indicates that stock market volatility at the NSE positively impacts economic growth. A conclusion of the study is therefore that higher economic growth leads to an improvement in stock market volatility to a significant extent. The study showed a negative relation amongst inflation rate and stock market volatility at the NSE leading us to make the conclusion that higher inflation rate has the tendency to lower performance at the NSE causing the lowering of stock market returns. Money

supply has a positive and significant effect on stock market volatility implying that the more liquid the market is, the more the stock market volatility.

The conclusion of the study therefore is that the predictor variables ; rates of interest, exchange and inflation, economic growth, money supply and external debt influence stock market volatility at the NSE largely since they account for 96% of variations in stock market volatility. The realization that the six predictor variables account for 96.2% of changes in stock market volatility imply that the factors beyond the model explain 3.8% of changes in stock market volatility. The significance of the model for the study was revealed by the F statistic. Thus, it is correct to state that these variables substantially affect stock market volatility as revealed by the p value in ANOVA.

This finding partly agrees with Mugambi and Okech (2016) who researched on how macroeconomic variables impacted the stock returns on banks listed at the NSE. In this research secondary data was obtained from CBK in the period 2000 to 2015. To establish the relationship, linear regression model, Unit Root test and correlation analysis was used. It was discovered from the study findings that bank stock return was significantly affected by interest rate, inflation, and exchange rate and insignificantly affected by GDP.

5.4 Recommendations

The findings were that inflation rate has a negative impact on stock market volatility recorded at the NSE. The variable was a substantial determinant of stock market volatility. A recommendation of the study to policy makers is that focus should be placed on current rates of inflation as it can negatively affect stock market volatility found at the NSE.

It was discovered that economic growth has a positive substantial impact on stock market volatility at the NSE. The study recommends the need to come up with measures that can boost economic growth as this will have an effect on the stock returns generated at the stock market. Interest rates were also found to have a significant positive effect on stock market volatility. A recommendation of the study is that the CBK should aim at regulating the interest rate prevalent in the country knowing that they have an influence on stock market volatility.

5.5 Limitations of the Study

The period selected in this study was 10 years that is from 2014-2019. There is no proof that alike outcome will remain the same in a longer period. More so, the findings might not even hold for the period beyond 2019. An extended period will lead to the results being reliable since it will include cases of major economic changes like recessions and booms.

The quality of data was the greatest limitation of this study. This is because it cannot be determined accurately that the secondary data represent the situation as it is in the ground. It is has only been assumed that the data is accurate. This is usually a general problem when dealing with secondary data. The research used secondary data, which was in the public domain had already been obtained, unlike the first-hand information associated with primary data.

This study focused on some factors that are hypothesized to influence stock market volatility at the NSE. Precisely, the study focused on six explanatory variables. In reality however, there are other variables that are likely to influence stock market volatility some which are internal such as management efficiency and leverage while others are not under

the control of management like political stability, balance of trade, and unemployment rate among others.

This study relied purely on secondary data. The limitation of using secondary data is that it does not capture qualitative aspect of a research which can also have a significant influence on research findings. If the study had considered some qualitative aspects by conducting interviews or focus group discussions, the findings would have been more comprehensive.

In achieving the analysis of the data, the study used a multiple linear regression model. Because of the restrictions involved when using the model like erroneous and deceptive outcomes that lead to the value of the variable changing, it was therefore not possible the findings of the study to be generalized with accuracy. More so the result could be different if more data was added in the regression. Hence the model was another limitation.

5.6 Suggestions for Further Research

The basis of the study was on selected macro-economic variables and stock market volatility at the NSE and reliance was placed on secondary data. A similar study that places reliance on primary data collection methods such as in depth questionnaires and interviews extending to all the quoted firms on the influences on stock market volatility would be more revealing since it would complement the current study.

The study did not exhaust all the predictor variables that influence the volatility of the returns at the NSE and hence recommends that additional studies be carried out to include additional variables like balance of payments, rate of unemployment, efficiency of management, performance of the industry, firm characteristics, political stability and

others. Identifying how each variable influences stock market volatility at the NSE will allow policy makers to identify the best tool for controlling returns.

The concentration of the study was on the past ten years because it was the most current and readily available data. Additional studies in the future may cover a much larger range for example from 1970 to date which will be helpful in approving or disapproving findings of the study. The advantage of a longer study is that it will enable the researcher to capture effects of business cycles such as booms and recessions.

The study limited itself making a focus only on the NSE. The researcher advises that additional studies be done on other sectors and regions for example East African Community. In addition, selected macro-economic variables can also affect other aspects of the economy such as economic growth, FDI, foreign remittances among others and therefore the need to conduct studies on the effect of these predictor variables on other aspects of the economy.

Finally, this study was based on a multiple linear regression model, which have its own limitations like erroneous and misleading results resulting from a change in variable value. Future researchers should focus on other models for example the Vector Error Correction Model (VECM) in examining the various relations between selected macro-economic variables and financial performance.

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APPENDICES

Appendix I: Research Data

Year	Qr.	NASI	Money supply	Interest rate	Exchange rate	Inflation rate	Economic growth	External debt
2010	1	71.4933	8.7288	8.417	79.581	16.833	0.092	13.945
	2	78.7133	8.9541	8.083	78.446	15.920	0.094	14.000
	3	85.1000	8.9078	7.750	76.243	13.393	0.097	14.050
	4	92.9467	8.9612	7.250	75.138	10.300	0.098	14.084
2011	1	109.4400	9.2043	6.917	76.488	7.850	0.098	14.133
	2	120.3933	9.2297	6.750	78.938	5.867	0.099	14.175
	3	123.3900	9.1571	6.000	80.926	4.707	0.099	14.251
	4	125.8767	9.1839	6.000	80.581	4.033	0.100	14.248
2012	1	135.6633	9.1845	5.833	82.236	4.157	0.100	14.243
	2	135.6633	9.1203	6.083	86.124	6.013	0.103	14.294
	3	137.0200	9.1953	6.500	93.014	9.020	0.104	14.334
	4	138.0267	9.1158	15.167	93.870	12.777	0.104	14.388
2013	1	138.0267	9.0249	18.000	84.139	15.827	0.104	14.399
	2	139.8667	9.1665	18.000	84.120	16.290	0.105	14.454
	3	139.8667	9.0766	15.333	84.276	14.297	0.106	14.511
	4	142.0933	9.2448	11.667	85.578	10.697	0.106	14.551
2014	1	142.0933	9.2510	9.500	86.721	7.257	0.106	14.582
	2	142.1500	9.3410	8.833	84.608	5.043	0.106	14.623
	3	142.1500	9.2492	8.500	87.255	4.563	0.107	14.678
	4	143.6200	9.2824	8.500	85.907	5.387	0.107	14.693
2015	1	143.7133	9.2375	8.500	86.327	6.203	0.107	14.774

Year	Qr.	NASI	Money supply	Interest rate	Exchange rate	Inflation rate	Economic growth	External debt
	2	143.7133	9.3641	8.500	87.247	6.827	0.107	14.840
	3	144.8667	9.3056	8.500	88.238	7.237	0.108	14.888
	4	146.0367	9.3163	8.500	89.878	6.977	0.109	14.934
2016	1	146.0367	9.2100	8.500	91.525	6.667	0.110	14.993
	2	150.5667	9.2677	9.000	95.844	6.657	0.111	15.061
	3	150.5667	9.2748	11.500	102.967	6.390	0.111	15.108
	4	157.6933	9.1634	11.500	102.381	6.437	0.112	15.141
2017	1	157.6933	9.1138	11.500	101.910	6.840	0.113	15.192
	2	161.7967	9.1501	10.833	101.035	6.590	0.114	15.265
	3	161.7967	9.3007	10.500	101.338	6.470	0.114	15.309
	4	162.5733	9.0423	10.500	101.734	6.403	0.116	15.334
2018	1	164.2400	9.1619	10.000	103.415	6.483	0.117	15.385
	2	166.5800	9.1617	10.000	103.359	7.723	0.118	15.427
	3	166.5800	9.1615	10.000	103.518	8.323	0.119	15.449
	4	168.7033	9.1614	10.000	103.351	8.153	0.119	15.473
2019	1	172.2033	9.3176	9.500	101.833	7.360	0.121	15.499
	2	172.2033	9.3016	9.000	100.759	5.683	0.122	15.550
	3	175.4733	9.3008	9.000	100.706	4.703	0.123	15.606
	4	184.5333	9.3001	9.000	101.908	4.603	0.123	15.613