EFFECT OF MACROECONOMIC VARIABLES ON VALUE-AT-RISK OF STOCK RETURNS FOR FIRMS LISTED AT THE NAIROBI SECURITIES EXCHANGE

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STUDENT'S DECLARATION

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

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Sign…… Date……

SUPERVISOR

I do hereby confirm that I have examined the master's proposal of Boreh R. Kipkoech

Sign……. Date……...

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Proposal Supervisor

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DEDICATION

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ABSTRACT

This study investigated the effect of macroeconomic variables namely inflation, interest rate and exchange rate on Value-at-risk of stock returns for listed firms in the Nairobi securities exchange for the period between January 2008 and April 2017 on monthly time series data. The results were reported using the Johansen cointegration test, vector error correction model (VECM) and causality test, which were reported using outputs from Eviews. The general objective of the study was to analyze the effects of macroeconomic variables on the VaR of stock returns of firms listed in the Nairobi securities exchange.

Based on the objectives of the study, analysis was done through the use of impulse responses functions and variance decomposition. The showed that VaR of stock returns responded to shock of the interest rate, exchange rate and inflation rate. A regression of VaR on inflation from the impulse responses demonstrated insignificant effect of inflation on VaR of stock returns of firms listed at NSE. The impulse response also revealed that the exchange rate had no significant effect on stock retuns VaR. Lastly interest rate was seen to have positive effect on the Value-at-Risk of the listed stock.

From the study findings it was concluded that it is possible to predict the current and the future VaR stock returns of firms listed in the Nairobi securities exchange by studying the past values of interest rates and inflation. The study further concluded that studying real gross exchange rates past values do not help in predicting the present and the future values VaR of stock returns of firms listed at NSE.

ACRONYMS & ABBREVIATIONS

ADF Augmented Dickey Fuller Test

ALM Asset Liability Management

APT Arbitrage Pricing Theory

CAPM Capital Asset Pricing Model

ECM Error Corrected Model

EMH Efficient Market Hypotheses

MPT Modern Portfolio Theory

NSE Nairobi Securities Exchange

PP Phillips Perrons

VaR Value-at-Risk

VARVector Auto-Regression

DEFINITION OF TERMS

Exchange rate	Average USD/KES rate during the month (Muradogalu & Metin, 2001)
Inflation Rate	The rate at which the general level of prices for goods and services is rising, and, subsequently, purchasing power is falling(Kim, 2003).
Interest Rate	This is the weighted average rate of 91-day treasury bill rate (Lipsey & Chrystal, 2007).
Value-at-Risk	These are the worst losses over a target horizon that will not be exceeded with a given level of confidence(Proviziontou, Markose & Menkens, 2005).

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

In recent past, the exponential growth of trading activity and the trading loss of the famous financial institutions have led the financial managements to pay great attention to the risk management skills. Among the different risk management skills, properly defining risks and its measurement is a very important topic for risk managers because they need to focus on developing reliable techniques for measuring financial instruments risk exposure. Therefore, risk managers and managerial accountants have implemented many different methods so the financial risks can be correctly predicted.

There are many techniques to measure financial risk, such as asset liability management (ALM) technique, mean-variance model introduced by Markowitz (1952) and CAPM model introduced by William Sharpe. All of these risk measurement methodologies have their own limitations, researchers and risk specialists attempt incredible push to enhance and make new risk measurement techniques. The most focussed on and developing risk measure technique is Value-at-Risk (VaR). VaR was developed as a risk assessment tool in banks and other financial service firms in the last decade. Its usage in these firms has been driven by the failure of the risk tracking systems used until the early 1990s to detect dangerous risk taking on the part of traders and it offered a key benefit: a measure of capital at risk under extreme conditions in trading portfolios that could be updated on a regular basis.

Tanna (2006) points out that VaR is the expected loss of a portfolio over a specified time for a set level of probability. Loosely speaking, the Value-at-Risk of a portfolio is the maximum loss that may be suffered on that portfolio in the course of some holding period, during which the composition of the portfolio remains unchanged (Rob and Perter, 1999). VAR measures the

potential loss in market value of a portfolio using estimated volatility and correlations. It is a measurement within in a given confidence interval, typically 95% or 99%. The concept of VAR seeks to measure the possible losses from a position or portfolio under "normal" circumstances. The length of this holding period is short-term, usually one day to a few weeks. VaR of an investor's portfolio is therefores the maximum amount of money he or she may lose in a short period of time. VaR is easy to understand and broadly used by financial institutions such as commercial banks, hedge funds, insurance companies and organisations that are involved in trading energy and other commodities for quantitative risk management for many types of risks. Moreover, it can calculate the portfolio risk of more than one financial asset. VaR technique is widely applied in the risk control fields.

Financial risks cannot be eliminated, but can be controlled. The control approach is the financial risk management, which means controlling the possible loss undertaken within the limits in the market economic activities.

A critical step of financial risk management practice is to construct a proper measure of risk. Both literature researches and application of risk measurement methods are developing gradually over time.

VaR uses profit and losses incurred as a result of movement in tradeable assets such as equities, foreign exchange, options forward contracts and futures. Stock prices are subject to economic shocks that can adversely affect the prices and thus the stock returns of holding a stock portfolio. Stock return is the gain or loss of the value of a share in a particular period usually quoted as a percentage. It consists of profits and losses incurred by an investor from the stock. Profit or losses are computed from the difference in price of a stock over two time periods divided by its purchase price.

A stock market frequently trades thousands of listed company shares on a daily basis. Investors evaluate the performance of a stock market by observing the level of the various composite market indices before investing their surplus funds. A market index is an aggregate value that produced by combining several stocks together and expressing their total values against a base value, usually from a specific date. Market indices provide historical stock market performance as well as a benchmark for comparison against performance of individual investor portfolios. Analysis of market indices can also provide investors with forecasts of future market trends (Zhang, 2009).

Many factors can influence the price movement of a stock from day to day. Factors internal to the firm, like favourable earnings, can push a firm's share price up due to increased demand since investors prefer to invest their money on winners. Other factors are beyond a firm's control including the macroeconomic, social, political and legal environment in which it operates. Potential investors therefore evaluate the overall climate and other firm specific factors to formulate expectations about the stock market before making investment decisions.

Past studies have shown macroeconomic factors influence changes in stock prices. According to Liu & Shrestha (2008), macroeconomic activities of a country influence the returns of its stock market. Muradoglu et. al (2000) have linked changes in stock prices to macroeconomic behaviour in advanced countries. Kirui, Wawire & Ono (2014) generally observed that Stock prices are determined by some fundamental macroeconomic variables such as interest rates, inflation, exchange rate, and Gross Domestic Product.

1.1.1 Macro Economic Variables

Inflation is a persistent increase in the general price level of goods and services in an economy over a time. As goods and services, require more money to purchase, the implicit value of money falls. Thus, high rates of inflation erode the purchasing power of an economy's currency.

Inflation is widely measured by calculating the movement in the Consumer Price Index (CPI). Prices of representative items collected periodically used to compute CPI. CPI is a statistical estimate and its percentage change used in measuring inflation either monthly, quarterly or annually.

Many past studies show that inflation has a significant impact on stock return. Whether that impact is positive or negative, however, is a matter of much debate. Chen et al (2005) observed that inflation is not able to predict stock returns. According to Tripathi and Kumar (2014), the relationship between inflation and stock returns in the BRICS conflicted, with Russia showing a significant negative relationship, while India and China exhibited a significant positive relationship.

The price of money is interest rate. Interest rate is proportion of loaned funds that an investor demands for the usage of said funds. Interest rate is used as a monetary tool to control other macroeconomic variables as investment, inflation and unemployment.

Alam and Uddin (2009) concluded there is a significant negative relationship between interest rates and stock prices of 15 developed countries using stock data for the period 1988 to 2003. Humpe and Macmillan (2007) arrived at similar conclusion too. In their study, they concluded that stock prices there exists negative correlation between long-term interest rate and stock prices in US and Japan.

Exchange Rate is the price of one country's currency expressed in another country's currency. The level of an economy's exchange rate is mainly determined against the US dollar. Empirical studies have shown significant relationship between exchange rates and stock returns. Karoui (2006) found a positive transmission mechanism between volatilities in equity and foreign exchange rates markets in a set of emerging economies. Nshom (2007) concluded that there is a significant exposure of stock returns to changes in exchange rates for some companies in a sample of FTSE 100 firms used in his study. Ibrahim & Aziz (2003) found out that the exchange rate was negatively associated with stock prices in the Malaysian equity market.

1.2 Problem Statement

VaR has several uses. First, it can be used by senior management to set risk targets and position limits. According to the desired level of risk a firm can set an overall VaR, which in turn represents the overall target risk. VaR is very helpful for the capital allocation. Since this number shows what is the maximum expected loss, the firm can determine its capital requirements at each different level or even at each individual investment. Thus, the riskier the activity the greater the VaR and consequently the greater the capital requirement and vice versa. VaR can be used to assess the risks of different investment opportunities before decisions are made, as well as to evaluate the performance of business units after the event. These uses make obvious that VaR methodology improves the process of risk management. By using such methods a risk manager can measure not only market risks but also other risks like credit, liquidity and cash flow risks. Finally, it enables firms to react quickly and appropriately to the capital adequacy regulation (Apostolos & Dimopoulos, 2004).

VaR is computed using univariate series of portfolio returns or P&L (Jorion 1999). VaR is high when market prices change considerable and low when little happens in the market. The stock

market is susceptible to economic shocks like foreign currency fluctuations, inflation rates and interest rates have an impact on the stock prices. The dynamic interactions among these various variables and the stock market prices for companies quoted on the Nairobi Securities Exchange have consequential effects on both market capitalization and company valuations, which makes investors sceptical about the future performance of companies. As a result, the stock prices may drop in the short run as well as the long run.

Several studies have been done on the causal relationships between stock market prices and various macroeconomic variables of interest rates, exchange rates and inflation. Adam & Tweneboah (2008) studied the impact of macroeconomic variables on stock prices in Ghana using Databank stock index as proxy to the stock market and inward foreign direct investments, the treasury bill rate (as a measure of interest rates), the consumer price index (as a measure of inflation), average crude oil prices, and the exchange rate as macroeconomic variables. He analysed quarterly data for the above variables from 1991 to 2007 using co integration test, vector error correction models (VECM).

Kitati, Zablon, & Maithya (2015) conducted a study seeking evidence to support existence of influence of foreign exchange, interest rate and inflation on stock prices of companies listed at the NSE.

However, despite the many researches done both on causal relationships between macroeconomic factors and stock returns on one hand and VaR of stock and volatility on the other, the real impact macroeconomic variables and stock VaR is missing. Moreover, there are contextual differences in the findings, which may be attributed to different levels of economic development and business environment. Further, there are glaring methodological challenges

facing the past studies since despite drawing time series data majority have analysed their data using ordinary least squares method and they have not factored in requisite diagnostic tests.

This study sought to investigate the effects of the macroeconomic variables of exchange rate of foreign currencies, inflation rate and interest rate on the VaR of stock portfolio for the period 2008 to 2017 for the case of Nairobi Securities Exchange in Kenya. The research mainly addressed the combined effect of the independent variables on stock market VaR. The study posed the question: what is the influence of macroeconomic variables of foreign exchange rates, interest rate and inflation rate on stock market VaR in Kenya?

1.3 Objectives of the Study

1.3.1 Overall Objective

The purpose of the study was to establish the effect of macroeconomic variables on VaR of stocks listed at Nairobi Securities Exchange.

1.3.2 Specific Objectives

This study was guided by the following objectives:

1. To establish the effect of inflation on VaR of stocks returns of listed firms at Nairobi Securities Exchange.
2. To determine the effect of exchange rate VaR of stock returns of listed firms at Nairobi Securities Exchange.
3. To examine the effect of interest rate on VaR of stock returns of listed firms at Nairobi Securities Exchange.

1.4 Research Questions

The study sought to answer the following research questions

1. What is the effect of inflation on VaR of stock returns of listed firms at Nairobi Securities Exchange?
2. What is the effect of exchange rate on VaR of stock returns of listed firms at Nairobi Securities Exchange?
3. What is the effect of interest rate on VaR of stock returns of listed firms at Nairobi Securities Exchange?

1.5 Significance of the Study

The issues raised in the background and problem statement motivated the current study. Therefore, the findings with yield benchmarking information for theorists, empirical scholars, investors, investment advisors and relevant authorities on the effect of macroeconomic factors on stock returns VaR of listed companies in Nairobi Securities Exchange (NSE).

Both theorists and empirists will benefits from the nexus between macroeconomic factors and VaR of listed companies. Moreover, the level of agreement or disagreement between existing theories, empirical enquiry and the study findings will inform the suitability of VaR in testing volatility in developing economies.

To the management of listed companies if there will be significant influence of macroeconomic factors on VaR. Then the study will form a benchmark against which future decision will be made by evaluating the prevailing economic environment. Moreover, there will be need for management to benchmark their decisions from empirically and theoretically tested models upon which they can mitigate against both systematic and non-systematic risks facing their companies.

To current and potential investors they will acquire a customized tool for evaluating their investment opportunities and more so the level of risk exposure prior to commit their capital in any viable investment opportunity. Moreover, investment advisors will be better placed on

documented empirical evidence depicting the effect of macroeconomic characteristic in VaR of listed companies in NSE.

1.6 Limitation of the Study

This study aims to analyse the effect of macroeconomic variables on stock returns VaRof firms listed at the NSE. Because of the large number of securities at NSE, the NASI index was used as a proxy to the stock market. It is however noted that the index is weighted index using all the stocks based on their market capitalisation and therefore representative of the whole stock market. The NASI index is also not adjusted for dividends in stock prices. Therefore, the findings may be limited to policy implications.

It is also possible that there are more than the three macroeconomic factors affecting stock returns. Furthermore, other variables like firm size, liquidity, management styles, profitability etc. may also affect the VaR of a company. However, this study is limited to the three macroeconomic factors, that is, exchange rate, interest rate and inflation.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter summaries sections that give theoretical and empirical back up to the study. The first section summarizes theories underpinning the association between macro-economic factors and stock price returns. The second section evaluates the determinants of stock price volatility.

2.2 Theoretical Review

In the following theories which will be guiding the study will be discussed. The study proponents, strengths, weakness and relevance in the study will be discussed. The current study will be based on efficient market hypotheses (EMH), modern portfolio theory and arbitrage pricing theory (APT).

2.2.1 Efficient Market Hypotheses

An efficient market is where the prices of security give real and true value of the asset. It is important to understand the term "efficient" as used in this theory. Efficient means that the quoted price takes into account all the information publicly available to all potential investors. The efficient market theory or hypothesis (EMH) became widely adopted after a finance theorist Fama (1970) developed a series of empirical tests in economic theory.

Fama (1970) argued there are levels of efficient markets depending on the kind of data revealed in the stock prices. All historical price information is incorporated in the current price in a weak form of the efficient market hypothesis and therefore security prices variations are random and cannot be predicted using past information. This is often referred to as the "random walk" theory. Under semi-strong efficient market hypothesis, the present-day price reveals all historically price-shaping information that is in the public and therefore investors' uses this kind

of information in identifying undervalued stocks under this market form. The strong form of efficiency market hypothesis postulates the present-day price reveals all price-shaping information in private and public domain and barely any investors will be able to scout constantly and find undervalued stocks. This theory is helpful in determining stock market returns and prices are explained by other factorsnot specific to the organisation. These variables include macroeconomic variables.

2.2.2 Modern Portfolio Theory

Markowitz (1952) developed Modern Portfolio Theory (MPT) to support investors in examining their expected returns primarily based on the predisposed risks. This theory seeks to maximise aninvestor's return on the portfolio and to minimise the portfolio risk in any level of expect portfolio return. Markowitz encourages diversification of assets by controlling both the kind and the amount of expected risk and return to avoid market risks.

MPT stresses determination of the numerical interactions among the specific securities that encompass the total investments rather than analysing the characteristics of individual investments (Omisore et al., 2012). The theory further suggeststhe importance of considering how each asset price changes relative to how every other asset in the portfolio changes in price considering other internal or external factors.

2.2.3 Arbitrage Pricing Theory

Arbitrage Pricing Theory (APT) aids in determining asset values using the law of one price and taking no arbitrage. APT suggests that numerous macroeconomic variables influences asset prices. However, CAPM theory assumes that a security's value is determinedsolely by one key macroeconomic factor.

APT arose as an alternate to CAPM. The shortcoming of CAPM is that it determines the returns of a security by only factoring in the return on the market. Fama (1977) argued that whether or not the models issues replicate weaknesses within the concept or in its practical application. CAPM is invalid due to its failure to empirical application. The model is founded on subjective sound judgement, and most of its underlying assumptions are unrealistic. Black (1972) and Ross (1976) proposed an extension of CAPM by developing entirely exceptional model. APT was based on the determination of the real intrinsic value of asset therefore no arbitrage chance exists in an efficient market. Pavola (2006) argued that APT is a brand new and exceptional model that helps determining asset prices. The model tries to take into account other influences not on the market that affect securities prices including macroeconomic factors.

2.3 Empirical Review

In the following section the relationship between macroeconomic factors and VaR will be discussed. The main issues to be addressed will be where, who and when the study was conducted. In addition, the key findings will be discussed and existing knowledge gaps will be pointed out.

2.3.1 Interest Rate and VaR

Governments or monetary authorities use several monetary tools to influence the economy. The interest rate is one of them and is used in order to influence the economy. An indication of a tight monetary policy is high interest rate. During periods of high interest rates, it is more costly for firms and individuals to borrow making it more unattractive to invest. Therefore, high interest rates have a tendency to decrease demand, while low interest rates stimulate demand in the economy (Lipsey & Chrystal, 2007).

It is generally acknowledged worldwide that interest rate fluctuations breeds uncertainty in firms. Graham & Harvey (2001) concluded that second most important risk factor in a company is interest rate and is a major contributor to assets and liabilities mismatch.

Research on influence of interest rate on stock performance has been widely done with focus on financial institutions because of interest rate sensitivity on their performance (Kasman et al., 2011; Memmel, 2011). However, interest rate fluctuations do affect nonfinancial institutions and organisations through their impact on the financing costs and the value of the assets and liabilities held by these companies (Bartram, 2002).

Interest rate is the cost that is charged to an individual investor or institution for use. The money borrowed can be used for mortgage financing, financing capital expenditure or even working capital. However, the relationship between interest rate and the stock market is more than that. All these forms of credit have an influence as interest rates (Lipsey & Chrystal, 2007). The interest rate that affects the investors is the interest rate from the bank, which is the cost that the bank needs to pay for using money from the depositors and borrow from central bank. The interest rate is important Central banks use interest rate to control inflation. In fact, interest rate influences money supply in an economy by either increasing or decreasing liquidity in the market (Saborowski & Weber, 2013).

From a basic and practical view, an increase in the interest rate by monetary authorities will not result in a direct impact on the stock market. Rather, it will become more expensive for banks to borrow money from the central bank. This will in turn influence both individuals and institutions appetite for credit. Individuals need to pay more for their credit cards and mortgages, and more so if the rate of interest is variable leading to a decrease in the amount of discretionary money. This will have an influence on the bottom line of companies. This is one of the ways in which

companies are affected. The impact of high interest rates on a company is two-fold. Companies borrow money from the banks and when borrowing is more expensive the companies have to pay higher interest on their borrowings. Higher expenses and less revenue slow down operations of companies resulting in decreased growth and profits. Since the value of the company is based on the expected future cash flows, fluctuations in the interest rate and a drop in the expected cash flows will lower the price of shares and influence the value of the company.

Financial theories mention that changes in interest rates influence both the expected future cash flows and the discount rates used by firms to discount future cashflows. This has a bearing on valuation of a firm (Martinez-Moya, Ferrer-Lapena & Escribano-Sotos, 2013).

Interest rate changes have a significant effect on the valuation of non-financial firms in three different ways. First, an increase in the interest rate leads to an increase the interest expense of highly indebted firms. The increased interest expense will result in decreased dividends payout and by extension a fall in share prices because of the decreased future cashlows from the dividends. A higher interest rate will also influence negatively the investment behaviour of investors (Bartram, 2002). Secondly, interest rate changes have an influence on the market value of the financial assets and liabilities of the nonfinancial institutions. Third, fluctuations in interest rates impact the opportunity costs of investments. An increase in interest rate makes bonds more appealing to investors due to their risk-return nature, and motivates investors to change their portfolios by purchasing bonds and selling shares, leading to a decline in share prices (Bernanke & Kuttner, 2005). An increase in the market interest rate can make government securities more appealing to investors since bonds are viewed as safer investment opportunities.

Mohammad et al. (2009) examined the relation industrial-production index, rate of foreign exchange, share price at Karachi Stock Market in Pakistan. The results of this study showed that

both rate of foreign exchange and foreign reserves significantly affect stock prices. The study also revealed that the influence of the two variables was also because of the reforms of the year 1992. The study also showed that consumer-price index and gross fixed capital formation too affect stock price. There was also a positive influence on stock prices by other variables such as supply of money and rate of foreign exchange.

Fowdar & Koonjal (2011) conducted a study in Mauritius to determine whether macroeconomic variables affect returns of the stock exchange. They used regression analysis and came to a conclusion that macroeconomic variables affect stock exchange. Since macroeconomic variables can have an impact on the performance of stock market, foreign investors use political risk to evaluate the performance of the stock market.

Attari & Safdar (2013) in Pakistan did a similar study of examining macroeconomic variables and stock market prices by applying Exponential GARCH and using monthly data from December 1991 to August 2012. They used also ADF and ARCH to check for correlinearity and homoscedasticity. The result of the research showed that there exists a significant influence of microeconomic variables on the prices of stock.

Patel (2012) used periodic statistics on starting January 1991 to December 2011 and examined effects of macroeconomic determinants on the Indian Stock market performance. He used eight macroeconomic variables: inflation, rate of exchange, industrial production index, interest rate, supply of money, price index of Gold, Silver and Oil. By applying ADF, Johansen co-integration test and VECM the study establised that interest rate is I(0); rate of exchange, IIP, prices of Gold, Silver and Oil are I(1) and supply of money and inflation is I(2). The study as well found out that a significant relationship between macro-economic factors and stock market indices exists.

A similar study earlier done in Nigeria by Maku & Atanda (2010) using ADF (Augmented Dickey Fuller) unit root examined the relationship between macro-economic factors and the performance stock market in the republic of Nigeria between the periods of 1984 and 2007. The results revealed high sensitivity of Nigeria Stock Exchange to fluctuations in the rate of exchange, real output, rate of inflation and supply of money. The study found out that macroeconomic variables have a trivial effect on the performance of stock market in Nigerian. They therefore suggested that stakeholders consider the above factors rather than treasury bill rate in their investment decision.

Qundir (2012) used ARIMA (Autoregressive Integrated Moving Average) model examined effect of selected macroeconomic factors on the rate of interest and index on industrial production on Dhaka stock returns as of Jan 2000 and Feb 2007. He found that a strong relation exists between rate of interest and index on industrial production with stock returns in Dhaka stock market. However, the figures did not show statistically significant relationship.

Olweny and Omondi (2011) study concluded that interest rate, exchange rate and inflation rate have significant impact on stock return volatility. In undertaking the study to establish how macroeconomic factors affect stock market performance, they made a collective assumption that the effects are the same in all the firms in the same way. They, however, failed to establish the nature and the extent of such contribution to performance differ from one company to another.

Adam & Tweneboah (2015) used Vector Error Correlation model (VECM) and Cointegration on 17 years data from 1999 to 2015 but on quarterly basis to look at impact macro-economic variables on price of stock in Ghana. They were observing short-run and long run relation on stock prices in Ghana. The VECM exhibited rate of interest lagged have important influence on stock market.

2.3.2 Exchange Rate and VaR

The U.S. dollar and the Euro are the most traded currencies in the world (BIS, 2013). It has become as main sources for international transactions. In January 2002, the Euro became official and after its introduction by the European member countries, it appreciated against the Dollar.

Important determinants of a country's exchange rate of foreign currencies are the demand and supply of the currency, inflation, interest rate and the economic and political risk (Shapiro, 2013; Lipsey & Chrystal, 2007). Because of the worldwide usage and acceptability, the U.S. dollar is accepted as the most important exchanges currencies.

The large increase in the world trade and capital movements have made the currency value as one of the important factors that influence business profitability and equity prices (Kim, 2003). Exchange rate fluctuations affect the international competitiveness of organisations, considering their impact on import and export prices. Organisations future cashflow change in relationship with currency valuations and thus the effect on its valuation. Economic theories suggests that exchange rates variability will result in a change in the investments and profitability, reflected in an organisations financial performance. Accordingly, movements in the company's operations influence stock returns (Agrawal, Srivastav & Srivastava, 2010). An earlier and frequently cited study by Dornbusch & Fisher (1980) indicate the same with a flow-oriented model. They argue that a depreciation in the local currency rallies the competitiveness of domestic companies and their exports and future cash flows. The effect of the currency depreciation is an increase in stock prices, as a response to the rise in expected cash flows. Conversely, an appreciation in the local currency will lead to a decline in foreign demand of an exporting company. This will result in declining profit, as would the stock returns. Consistently, for an importing company the

sensitivity of a firms value to currency value fluctuations is just the opposite (Yau & Nieh, 2006).

Exchange rate flactuation can affect the stock performance of local domestic firms (Agrawal et al., 2010). Domestic companies with no international operations, assets, liabilities and transactions are also exposed to exchange rate fluctuations since their input and output price channels, supply and demand chains or the prices of the competitors might be affected by exchange rate fluctuations.

Ochieng & Oriwo (2013) studied the effects of macroeconomic variables on NSE All share index. In their study they also tried to establish whether macroeconomic variable changes can be helpful in predicting future NSE all share Index. The study looked at interest rate, inflation rate and ninety-one days Treasury bill rate as the three important macroeconomic variables. Using regression analysis, the study concluded that out the 91–day Treasury bill rate negatively affected the NASI while Inflation rate had a fragiled-positive relation with the NASI. In their conclusion, they advocated for close monitoring of the macroeconomic environment as a result of the impact the stock market performance which significantly influences decisions foreigners make on the local investments.

Kyangavo (2016) studied the effects of macroeconomic variables on price index of listed commercial banks in Kenya using data from January 2000 and December 2013. He observed that interest rates and exchange rates had significant and positive effects on the banking stock index while GDP had insignificant negative effect on the same.

2.3.3 Inflation Rate and VaR

Inflation illicit negative news by the stock market, because it has a tendency to curb consumer spending and therefore a dip in a company's earnings. When there is a general price increase in a

country, the industrialist makes profit. The prices of the shares rise. The control of inflation has become one of the major objective of government economic policy in many countries. Effective policies to control inflation need to focus on the underlying causes of inflation in the economy.

The use of higher interest rates to control inflation reduces aggregate economic demand by discouraging borrowing by both households and companies. This leads to reduced money supply leading to a decline in inflation rate

The government controls inflation using fiscal policy by increasing direct taxes. Direct taxes have an effect of reducing disposable income. The government can also lower its spending leading to reduced borrowing by the government.

These fiscal policies increase the rate of leakages from the circular flow and reduce injections into the circular flow of income and will reduce demand pull inflation at the cost of slower growth and unemployment. There are several theories that link inflation rate to investments and hence stock market prices.

Fisher (1930) hypothesised that the nominal rate of return consists of two components: the real rate of return and the expected inflation. The real rate of return of a stock is independent of any changes in inflation rate. An increase in inflation causes the nominal rate of return to increase without causing any changes in the real rate of return. This means that value of assets or/and claims to assets such as stock are unaffected by inflation, thus they tend to hedge the value of the asset against inflation.

An alternative theory called as “proxy hypothesis” presented by Fama (1981), argues that there is no relationship between inflation and stock prices. However, he claimed that a negative correlation exists between the two variables, which are produced by two relationships between: inflation and anticipated economic activity and anticipated economic activity and stock returns.

Negative relationships exist between inflation and anticipated economic activity, on the other hand, a positive relationship exists between anticipated economic activity and stock returns, as anticipated economic activity declines investor require higher risk premium in compensation for anticipated slower and volatile economic growth, this causes the stock prices to decline.

Another explanation was suggested by Cohn & Modilgiani (1979) who argued that investors undervalue stock as a result of increase of inflation. He explained that investors adjusted their discount rate to prevailing nominal interest rate. However, failure to adjust their forecasted nominal future cash flows would prone investors to the error of discounting real future cash flows at nominal rates.

Muradogalu & Metin (2001) in their study of the long run consequence of monetary policies on return on stock in a developing market concluded that influence of money supply on interest rates contracted over time as markets gained maturity as foreign exchange redeemed their importance. They advised against the use of the results in developing investment plans because the variables explaining the change in interest rates change over time.

Similarly, Ibrahim & Aziz (2003) in their study on the effects of stock price on macroeconomic factors, which included industrial production, exchange rates, money supply and final-consumer price index, established a significant relationship among industrial production, consumer index and stock prices while exchange and money supply indicated a negative relationship.

Patra & Poshakwale (2006) in their analysis of dynamic adjustments and equilibrium effects of consumer-product price index, supply of money, rate of exchange and quantity of trading, and stock prices in the developing securities market of the republic of Greece during the years 1990 to 1999 found out that there a correlation between consumer-product price index, supply of money and quantity of trading and stock return both in the long and short run equilibrium, hence

no correlation between exchange and stock prices. The study also revealed that information to the public domain on macro-economic factors can be used in forecasting security market prices thus rendering the Athens stock exchange market informational inefficient.

Aydemir & Demirhan (2009) examined the correlation between three stock price indices; national 100, financials and technological industry index and macroeconomic variables in Turkey between the years 2001 to 2008 established that a strong correlation exist between rate of exchange and all the three security market indices. Using quarterly data of the years 1986 to 2008, the study established that national 100 services, financial and industrial indices negatively affects the exchange rates. Technology however posted a positive relationship with exchange rates.

2.3.4 Value-at-Risk

Value-at-Risk (VaR) is essentially a measure of volatility, specifically how volatile an investor' or firms assets. Assets that exhibit high volatility present higher risk. VaR also takes into account the correlation between different sets of assets in the overall portfolio. If the market price performance of assets is closely positively correlated, this also presents higher risk

In financial market terms, volatility is a measure of how much the price of an asset moves each day (or week or month, and so on). Speaking generally, higher volatility equates to higher profit or loss risk.

Volatility is important for both VaR measurement and in the valuation of financial assets. It is a method of measuring current asset price against the distribution of the asset's future price. Statistically, volatility is defined as the fluctuation in the underlying asset price over a certain period of time. Fluctuation is derived from the change in price between one day's closing price

and the next day's closing price. Where the asset price is stable, it will exhibit low volatility and the opposite when price movements are large and/or unstable.

VaR is an estimate of an amount of exposure cash value. It is based on probabilities, so cannot be relied on with certainty, but reflects rather a level of confidence, which is selected by the user in advance. VaR measures the volatility of a company's asset prices, and so the greater the volatility, the higher the probability of loss. Essentially VaR is a measure of the volatility of an investor's trading book.

The widespread application of VaR follows its use by regulatory authorities to calculate banks' market risk capital requirement. The regulatory standard involves reporting the 10-day Value-at-Risk at 99 per cent confidence level on trading portfolios of banks. The current common practice is to use the daily-VaR, routinely calculated using the banks' internal models, and scales it up to the 10-day VaR using the square-root-of-time rule (Proviziontou, Markose & Menkens, 2005).VaR uses statistical methods to derive a single number that summarizes market risks. It enables a firm to determine which investments offer the highest expected returns at the least expense of risk.

2.5 Summary of the Literature Review

Stock returns are to most extent influenced by Macroeconomic factors. The two significant factors affecting security prices are Interest rates and foreign exchange rate risks (Hyde, 2007, Vazzet al., 2008). Numerous empirical evidence have been developed that shows that indeed securities price volatility is significantly influenced by macroeconomic factors. According to Guo (2003), share price volatility in ordinary investments of shares is brought about by the systemic risk faced by those investors. According to (Hull & Alan, 1993) statistically, volatility is the disparity of the return on an asset from their mean. Damodaran (2012), volatility is the

deviation of mean returns from expected returns and therefore represent either positive or negative volatility otherwise known as upside or downside risk.

The capital market provides individuals and firms with an efficient mechanism to liquidate or make investments in securities (Black, 2004). The point that investors are sure of the possibility of disposing what they hold, as and when they want, is a major motivation for investment as it guarantees movement of capital between the surplus spending units (SPUs) and deficit spending units (DSUs). The fluctuations in stock prices and the trend of changes have continuously been of interest in the capital markets given their influence on the stock market stability and plans adopted by investors (West & Worthington, 2003).

The Kenyan stock market is vulnerable to global macroeconomic changes. Such changes intermittently manifest as external shocks occasionally neutralizing and/or reinforcing the internal market conditions. Recent external shocks have included a global recession (2007), a drought (2011), and the depreciation of the Kenyan Shilling against the United States Dollar in 2015 (Dyer & Blair, 2016).

In 2006, the NSE 20-Share Index recorded an all-record high of 6,400. The index fell steeply in 2008 through 2009 because of the global economic recession and the 2007-2008 Kenyan post-election chaos. It rose again in 2009 through 2010 as the worldwide economy began a slow recovery aided by United States Stimulus. It then had its sharpest rise in 2011 through 2013 as the effect of quantitative easing by major global central banks depressed global interest rates. The NSE 20-share index reached another peak in Dec 2014, after which it started a continuous decline impelled by high domestic rates, prospect of increasing global rates in the near term and the depreciation of the Kenyan Shilling vis-à-vis the Dollar. NSE 20-share index closed 2015 at around 4,040.75 having dropped 20.97% from 5,112.65 in 2014. The NSE 20 share Index fell

further in 2016 to close at 3,186.21 having shed 21.13% of its value as investors took a backseat over uncertainty of general elections to that will be held in August 2017 and the expected shortfall in banks profitability following capping of interest rates (NSE, 2017).

This erratic prices and high volatilities in the stock index is of concern to the risk professional as they try to manage and hedge the risk of holding stock portfolio and setting aside of capital to cushion investors and institution in cases of losses resulting from holding a risky asset portfolio.

In view of such losses, rational investors will always have an interest to track the movement of stock market returns having a bearing in their investments and to be able to predict returns in order to make rational investment decisions. The available literature on the Nairobi Securities exchange only address the effect of macroeconomic variables on stock market performance or on economic growth. Some of this literature include literature on the effect of macroeconomic factors on stock market returns and volatilities for firms listed at the NSE. However, risk of holding portfolios of stocks listed at the NSE is lacking and this study therefore seeks to fill that literature gap. It examines how macroeconomic factors that drive the NSE bourse affect the VaR of stocks to provide a basis of decision making in predicting worst losses over a target horizon that will not be exceeded with a given level of confidence by both the investors and policy makers.

2.6 Conceptual Framework

This section presents the relation about the independent and dependent variables of the study. According to (Mugenda and Mugenda, 2003) the framework outlines a working definition of variable and uses a diagram to pose a vivid and easy clarification of the movement of conceptual-framework. In this study, the dependent variable will be VaR of Nairobi All Share

(NASI) Index while the independent variables will be exchange rate, inflation rate and interest rates.

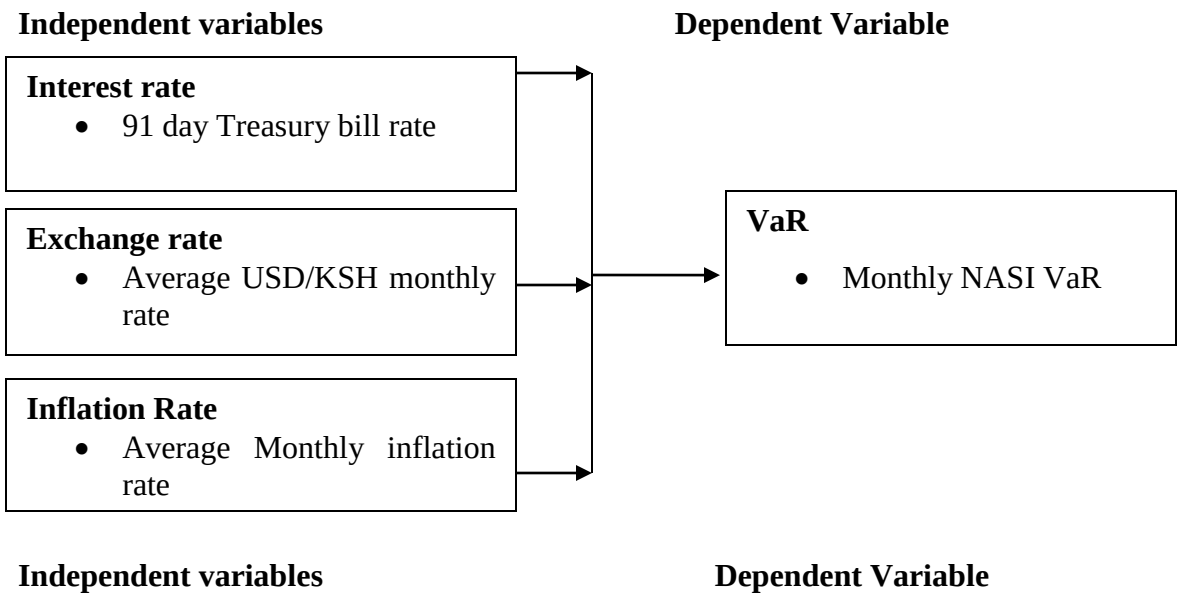

Figure 2.1 Conceptual Framework

Table 2.1 Operationalization of the Variables

Variable	Description	Measure
Interest Rate	This is the weighted average rate of 91-day treasury bill rate	Sourced from CBK
Inflation Rate	The rate at which the general level of prices for goods and services is rising, and, subsequently, purchasing power is falling.	Sourced from CBK
Exchange rate	Average USD/KES rate during the month	Sourced from CBK
Value-at-Risk	This are the worst losses over a target horizon that will not be exceeded with a given level of confidence. This is computed from NASI index returns. The Index was sourced from Nairobi Securities Exchange	$VaR_{t+1} = -\kappa(\alpha) * \sigma_{t+1}$

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The way in which research is to be conducted may be considered of in terms of the research idea subscribed to, the research approach to be employed and so the research instruments to be employed in the pursuit of a goal – the research objectives - and the pursuit for the answer to a problem - the research questions. Research questions and research objectives have been outlined in chapter one. This chapter therefore shall cover research design combining type of research, population, sampling technique, and sample size, instruments and data analysis.

3.2 Research Design

According to Orodho (2003) a research design is the plan that is used to generate answers to research questions. Lavrakas (2008) defines research design as general plan or strategy for conducting a research study to examine specific testable research questions of interest. The choice of research strategy according to Sounders, lewis& Thornhill (2009) is guided by the research question(s), objective(s), the extent of existing knowledge, amount of time and resources available as well as the philosophical underpinning.

This study employs correlation research design. Correlational research is concerned with assessing relationships among variables. It is based on the premise that if a statistically significant relationship exists between two variables, then it is possible to predict one variable using the information available on anothervariable e.g. price and demand. Correlation is a measure that indicates how one variable, factor or attribute varies in relation to another. The variation could be negative or positive. According to Kothari(2004) a correlational research is used to explore the relationship between variables and this is consistent with this study which seeks to establish the relationship between macroeconomic factors and stock market VaR.

The basic empirical investigation here was to determine whether there exists a relationship between VaR of stocks and the macroeconomic variables.

3.3 Target Population of Study

Mugenda & Mugenda (2003) defines population as a set of people, services, elements, events, group of things or households that are being investigated. According to Cooper and Schindler (2006), a target population is a population having the desired information. In addition, target population is defined as the population to which the researcher wants to generalize the results of the study. The population in this study consisted of all the firms listed and active at the NSE between January 2008 and April 2017.

3.4 Sample Size and Sampling Technique

Kothari (2004) describes a sample as a collection of units chosen from the universe to represent it. Black (2004, 2011) defines sampling as the selection of individuals from within a population to yield some knowledge about the whole population, especially for the purpose of making predictions based on statistical inference. In the current study census sampling approach was adopted and all listed companies within 2008 to 2007 will be considered in the study.

3.5 Data Collection Instruments

Creswell (2002) defines data collection as a means by which information is obtained from the selected subjects of an investigation.For this study, secondary data will be collected. The data for stock returns will be obtained from the Nairobi Securities Exchange. Data on exchange rate and interest rates will be obtained from the Central Bank of Kenya while data on inflation will obtained from the Kenya National Bureau of Statistics.

Monthly average 10-day VaR was computed from NASI index returns using RiskMetrics approach. In calculating stock VaR, the researcher modelled the time-varying volatility using Exponentially weighted moving average (EWMA) which is a method proposed by Riskmetrics.

In this case, the volatility is assumed to follow an AR(1) process:

$$\delta^2 = \lambda\delta_{t-1}^2 + (1-\lambda)(r_t - u)^2$$

where μ is the unconditional mean and λ is an arbitrary constant from (0,1).

The historical volatility is estimated as

$$\delta_t^2 = \frac{1}{n}\sum_{i=t-n-1}^{t}(r_i - \mu)^2$$

This formula imposes equal weights $\frac{1}{n}$ for the last n observations. In order to have the volatility more time-varying, we may increase the weight of the latest observation and use exponentially decreasing weights for other observations. Hence, we modify the calculation as follows:

$$\delta_t^2 = (1-\lambda)(r_t - \mu)^2\lambda\delta_{t-1}^2$$

which is the formula for EWMA-based volatility. Note that the scaling factor $(1-\lambda)$ is needed in order to have the weights summing up to 1.

In practical application, the value of λ is set to 0.94, which is the value proposed by Riskmetrics as well.

We compute the empirical quantile of the historical standardized distribution, that is the distribution of 10 day returns scaled by each days' estimated standard deviation from the model, and then we scale this up by the model's forecast of tomorrow's standard deviation. VaR is computed for 99% levels of confidence.

The 10-day VaR forecasts are provided by the following formula:

$$VaR_{t+1} = -\kappa(\alpha) * \sigma_{t+1}$$

where κ(α) is the α percentile of the standardized distribution and α is one minus the desired confidence level (l-α)%. The term σ_{t+1} represents the standard deviation of the returns at time t. The standard deviation estimate that is used to standardize returns is found from the EWMA model. These standardized returns give us the empirical distribution of portfolio's returns, which we use to produce VaR forecasts. The VaR is then averaged monthly.

3.6 Data Analysis

Data analysis refers to the application of reasoning to understand the data that has been gathered with the aim of determining consistent patterns and summarizing the relevant details revealed in the investigation (Zikmund, Babin, Carr & Griffin, 2010). To determine the patterns revealed in the data collected regarding the selected variables, data analysis is guided by the aims and objectives of the research and the measurement of the data collected. The data collected was sorted and input into Eviews statistical package and Microsoft Excel for production of graphs, tables, descriptive statistics and inferential statistics. Regression analysis was be used to test the significance of the independent variables on the dependent variable. Regression analysis was performed using the regression model specified below to estimate and provide empirical evidence on the nature of relationship between the stock VaR and the macroeconomic factors.

A multivariate regression model was also be adopted to assess the relationship between the independent variables, which are inflation, exchange rate and interest rates on the dependent variable is the VaR of the listed companies. A linear model regression analysis as illustrated in the equation below, consisting of time series data was used to provide empirical evidence. The period covered is between January 2008 to April 2017.

$Y=ß_0+ß_1X_1+ß_2X_2+ ß_3X_3 + e$

Y = Average Monthly 10-day VaR of Nairobi Securities Exchange All Share Index (NASI)

$ß_0$ = Constant term (equation constant)

$ß_i$ = Beta coefficients of explanatory/Independent variables

X_1 = Inflation Rate

X_2 = Exchange rate of Kenya shilling against USD

X_3 = Interest rate using 90 day treasury bills

e = Representative of the error terms introduced by variables not considered in the model.

Moreover, Vector Auto-Regression (VAR) analysis will be employed to achieve the three objectives of the study. The approach has the strength of allowing free theory estimation of hypothesised models(Sims, 1980). The main purpose of the study will be to examine the effects of macroeconomic factors in VaR of listed companies.

3.6Time Series Properties

3.6.1 Stationary Tests

Since the study also used time series data there was a need to test for stationarity. If the mean, variance and autocorrelation of data structure are uniform over time, then the data will be stationary (Wooldridge, 2012). The test is paramount prior to fitting the model since ignorance of non stationary characteristics of data would yield spurious modelling (Wooldridge, 2012).The augmented Dickey Fuller (ADF) unit root test was used with the null hypothesis of non stationarity. If the null is rejected, this will imply stationarity (Gujarati, 2003). If any of the variables is non stationary, it shall be differenced and subsequently used in the model (Gujarati, 2003).

3.6.2 Granger Causality

This is be used to test the explanatory power of any two variables under investigation and which ones explain the other in a better manner (Granger, 1988). The presence of Granger Causality can be explained by is elaborated by ability of a variable to explain each other more accurately from past data (Zou, Ladrou, Guo, & Feng, 2010). Granger Causality will be carried out to assess the reverse effect of VaR on macroeconomic characteristics. The null hypotheses will be macroeconomic factors do not Granger Cause VaR. If the p value will be less than 0.05 then it would mean that macro economic factors granger cause VaR.

3.6.2 Co-Integration and error correction mechanism

Trends whether stochastic or deterministic result into spurious regression results, un-interpretable student t-values and other statistics have too high goodness of fit which make results difficult to evaluate. The remedy will be to stationarise the data by differencing. Differencing, however, leads to loss of long run properties as the model in difference has no long run solution. This will be remedied by measuring variables in the level form while maintaining stationarity with short run (impact effect) and long run properties simultaneously incorporated by the use of the error correction mechanism (ECM) or feedback mechanism in the Cointergration analysis.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

In the current section results of the study will be presented. First, descriptive analysis followed by regression and finally time series analysis. The analysis will be as per the study objectives and research questions.

4.2 Descriptive Analysis

Descriptive analysis shown in Table 4.1 shows that the average Value-at-Risk was 0.92. Var was not normally distributed as per Jarque Berra test with p value less than 0.05. Indeed it was skewed in negative direction. The average 90 day Treasury bill rate was 8%, with a maximum of 29% and minimum of 1%. A scrutiny of its normality characteristics revealed that there it was skewed to positive direction. Thirdly, the average exchange rate was 86.50 Ksh/USD, with a maximum of 105.28 and minimum of 61.90. There was a wide variation in the exchange rate which indicates that the Kenyan currency strengthened and weakened within the period under investigation. The average inflation rate was 9%, with a minimum of 4% and a maximum of 17%. There is need to mitigate the fluctuations of interest and manage it well especially it is two digits.

Table 4.1 Descriptive Statistics

	VaR	Interest rate	Exchange rate	Inflation rate
Mean	0.92	1.08	86.50	1.09
Median	0.93	1.07	85.91	1.07
Maximum	0.97	1.29	105.28	1.17
Minimum	0.67	1.01	61.90	1.04
Std. Dev.	0.05	0.05	10.44	0.04
Skewness	-2.36	1.58	-0.03	0.96
Kurtosis	10.83	6.11	2.56	2.55
Jarque-Bera	390.20	91.34	0.94	18.17
Probability	0.00	0.00	0.63	0.00
Sum	102.92	120.49	9687.60	121.60
Sum Sq. Dev.	0.24	0.29	12089.70	0.17
Observations	**112**	**112**	**112**	**112**

4.3 Regression Analysis

The study hypothesed a nexus between interest rate, exchange rate, inflation rate and VaR as shown by:

$Y=ß_0+ß_1X_1+ß_2X_2+ ß_3X_3 + e$

Where

Y = Average Monthly 10-day VaR of Nairobi Securities Exchange All Share Index (NASI)

X_1 = Interest rate, X_2 = Exchange rate of Kenya shilling against USD, X_3 = Inflation rate

From the study findings it is clear only inflation rate has negative significant relationship with Value-at-Risk. On the other hand both interest rate and exchange had positive insignificant relationship with Value-at-Risk. These findings are in contrast with documented empirical evidence as documented in chapter two.

Table 4.2 Regression Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent Variable		**Value-at-Risk**		
C	1.31	0.13	9.90	0.00
Interest rate	0.09	0.09	0.96	0.34
Exchange Rate	0.00	0.00	1.72	0.09
Inflation Rate	-0.50	0.12	-4.18	0.00
R-squared	0.23	Mean dependent var		0.92
Adjusted R-squared	0.20	S.D. dependent var		0.05
S.E. of regression	0.04	Akaike info criterion		-3.49
Sum squared resid	0.19	Schwarz criterion		-3.39
Log likelihood	199.27	Hannan-Quinn criter.		-3.45
F-statistic	10.51	Durbin-Watson stat		0.51
Prob(F-statistic)	0.00			

Owing to the above findings as shown in table 4.2, the study proceeded to test the appropriateness of the model by testing for the five regression assumptions which are linearity, homoscedasticity and autocorrelation.

Scatter plots were used to test for linearity as shown in appendix 2. The scatter plots in Figure 4.2 revealed that there is was linearity relationship between VaR and both exchange rate and interest rate though there was none with interest rate. These results were mirrored by correlation analysis which revealed no significant linear relationship between interest rate and VaR.

Table 4.3 Correlation Analysis

	VAR	Interest rate	Exchange rate	Inflation rate
VAR	1			
Interest Rate	-0.02	1		
	0.83	-----		
Exchange Rate	0.30	0.22	1	
	0.00	0.02	-----	
Inflation rate	-0.43	0.36	-0.29	1
	0.00	0.00	0.00	-----

Normality of the residuals was tested by use of histograms the tested revealed non normality of the data, which was confirmed by Jarque Berra test statistics of 151. 98 and p value of 0.00.

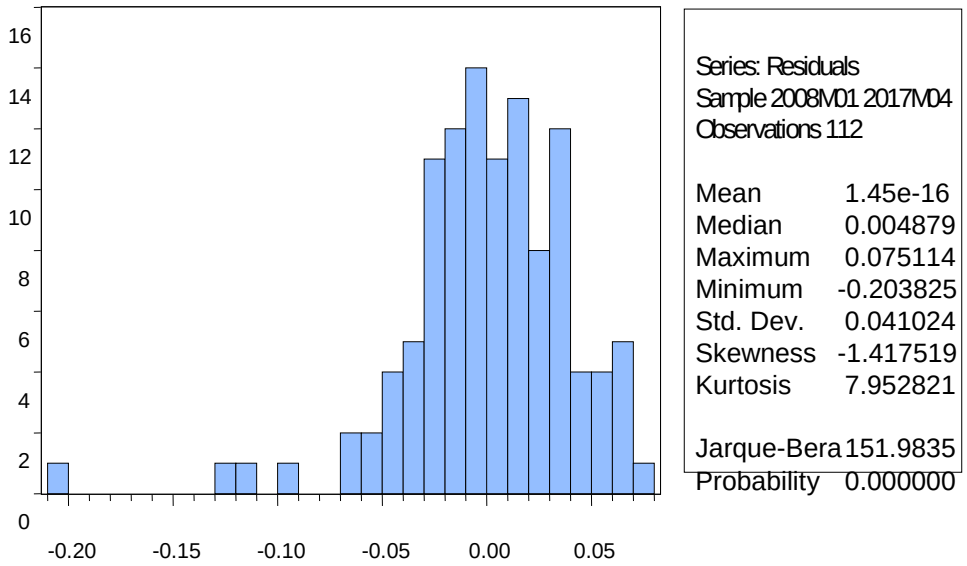

Figure 4.2 Normality Test

The pictorial presentation in Figure 4.3, tests the randomness of the error using the graph for actual and residuals and it shows there were no randomness in the error terms.

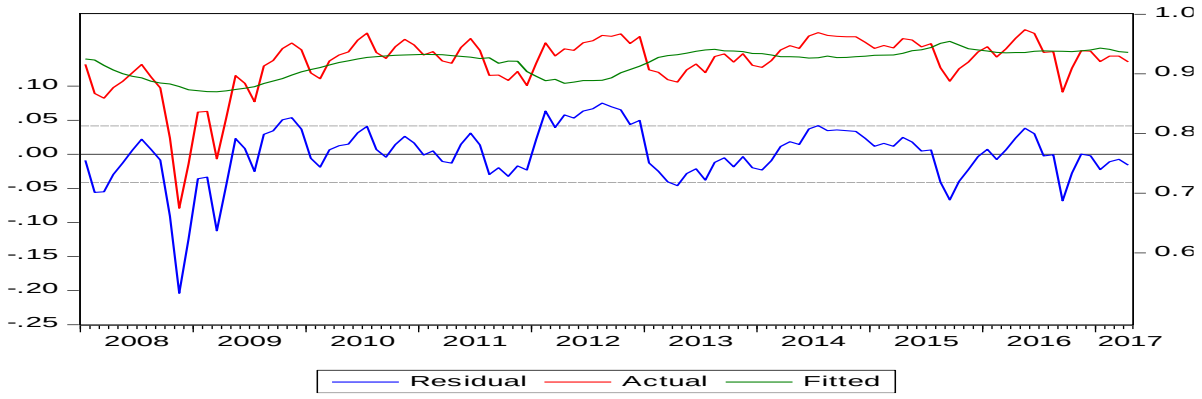

Figure 4.3 Actual and Resiudual Fitted Graph

Further, serial correlation was tested using Breusch-Godfrey serial correlation test as shown in Table 4.4, it revealed that there were serial correlation since the p value was less than 0.05.

Table 4.4 Breusch-Godfrey Serial Correlation LM Test

F-statistic	74.1194	Prob. F(2,106)	0.00
Obs*R-squared	65.30375	Prob. Chi-Square(2)	0.00

Lastly, heteroskedasticity was tested using white test; the test hypothesed that there was no heteroskedasticity. Since the p value was less than 0.05, then there was enough to warrant rejection of the null hypotheses and conclude that there was heteroskedasticity.

Table 4.5 Heteroskedasticity Test: White Test

F-statistic	2.880314	Prob. F(9,102)	0.005
Obs*R-squared	22.69616	Prob. Chi-Square(9)	0.007
Scaled explained SS	73.366	Prob. Chi-Square(9)	0.000

Owing to the inadequacies of the data as shown by the violations of the linear regression models, the study adopted time series analysis more so because the data was time series in nature.

4.4 Time Series Analysis

4.4.1 Stationarity Test

Stationarity was tested using ADF as shown in Table 4.6, none of the variables was stationary at levels, and therefore there were presence of unit roots. Consequently, it was paramount to difference VaR, interest rate, exchange rate and inflation rate at first difference.

Table 4.6 Unit Root Test at Levels

Variable	**Test at levels**	**ADF Test**		
		T statistic	**Critical Value at 5%**	**P value**
VaR	Constant	-2.94	-2.89	0.04
	Constant and Trend	-3.36	-3.45	0.06
Interest rate	Constant	-3.15	-2.89	0.03
	Constant and Trend	3.18	-3.45	0.09
Exchange rate	Constant	-1.20	-2.89	0.67
	Constant and Trend	-3.17	-3.45	0.09
Inflation rate	Constant	-2.66	-2.89	0.08
	Constant and Trend	-2.40	-3.45	0.37

As shown in Table 4.7 it was found that VaR, interest rate and exchange rate were stationary at first difference while inflation rate was not and it was imperative to test its stationarity at second difference as summarised in Table 4.8. Therefore, we can conclude that VaR, interest rate and exchange were integrated to order 1(I,1).

Table 4.7 Unit Root Test at First Difference

Variable	**Test at levels**	**ADF Test**		
		T statistic	**Critical Value at 5%**	**P value**
VaR	Constant	-5.69	-2.89	0.00
	Constant and Trend	-5.67	-3.45	0.00
Interest rate	Constant	-4.19	-2.89	0.00
	Constant and Trend	-4.17	-3.45	0.00
Exchange rate	Constant	-7.44	-2.89	0.00
	Constant and Trend	-7.40	-3.45	0.00
Inflation rate	Constant	-2.01	-2.89	0.28
	Constant and Trend	2.09	-3.45	0.54

As shown in table 4.8, inflation was stationary in second difference and hence we can conclude that it wasintegrated at order 2 (I, 2).

Table 4.8 Unit Root Test at Second Difference

Variable	**Test at levels**	**ADF Test**		
		T statistic	**Critical Value at 5%**	**P value**
VaR	Constant	-5.49	-2.89	0.00
	Constant and Trend	-5.45	-3.45	0.00
Interest rate	Constant	-13.29	-2.89	0.00
	Constant and Trend	-13.22	-3.45	0.00
Exchange rate	Constant	-6.75	-2.89	0.00
	Constant and Trend	-6.72	-3.45	0.00
Inflation rate	Constant	-4.12	-2.89	0.00
	Constant and Trend	-4.16	-3.45	0.00

4.4.2 Lag Selection Criterion

It is paramount to select the optimal number of lags, in the current study different methods were used to select the optimal lags as shown in Table 4.9, there were conflicting lag selection options since both Schwarz information Criterion and Hannan Quinn information selected the optimal lags as 2 while Sequential modified LR, final prediction error and Akaike information criterion selected the optimal number of lags as three. Therefore, we conclude that the optimal number of lags was three since according to Gutierrez, Souza and Guillen (2010), the optimal number of lags should be determined by AIC since it yields considerable gains in selecting the appropriate model.

Table 4.9 Lag Selection Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	183.5705	NA	4.23E-07	-3.32538	-3.22604	-3.2851
1	693.8916	973.3902	4.47E-11	-12.4795	-11.9828	-12.2781
2	884.122	348.7557	1.78E-12	-15.706	-14.81192*	-15.34346*
3	905.4324	37.49056*	1.62e-12*	-15.80430*	-14.5129	-15.2807
4	916.6189	18.85125	1.78E-12	-15.7152	-14.0264	-15.0304

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

4.4.3 Cointegration

Because the variables under investigation were integrated of order two, it was deemed fit to test their cointergration. Whenever two time series deviates from each other then there are perceived to depart from stationarity and are cointregrated. Johansen Cointergration test was adopted owing to its multivariate nature and can examine concurrent cointergration of variables. Indeed,

it can be used to show long and short run differences between variables. Trace statistics were used to test significance of Eigen values.

As shown in Table 4.10 the Cointergration rank (r), whereby Trace statistics are mostly used to test the null hypothesis that there is no cointergration against the alternative that there is cointergration. The procedure for testing is to commence with the hypotheses that H0: r=0; in this case the value of the number of hypothesized CE (s) (number of cointergration) is taken to be r, whenever, the null for Ho: = 0 is not rejected we proceed to null that Ho: = 1. In our case the trace is equal to 2; which is greater than 0 and less than the number of variables; then the series is cointergrating among the variables and consequently we proceed with vector error correction model (VECM). This implies there is a long run relationship between VaR and macroeconomic characteristics.

Table 4.10 Cointergration

Trend assumption: No deterministic trend (restricted constant)
Series: VaR Interest rate Exchange rate Inflation rate
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.67695	171.4008	54.07904	0.00
At most 1 *	0.239066	49.36628	35.19275	0.0008
At most 2	0.113205	19.85969	20.26184	0.0567
At most 3	0.061755	6.884396	9.164546	0.1326

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

4.4.3 Granger Causality

Granger causality was carried out to examine the causal link between VaR and macroeconomic variables. Results shown in Table 4.10 shows that there was unidirectional causality from exchange rate to Value-at-Risk, also there was a unidirectional causality from Value-at-Risk to

interest rate and also a unidirectional causality from inflation rate to interest rate. Moreover, there was a directional causality from interest rate to exchange rate.

Table 4.10 Granger Causality

Null Hypothesis:	F-Statistic	Prob.	Conclusion
Interest rate does not Granger Cause VAR	0.51	0.68	
VAR does not Granger cause Interest rate	0.09	0.96	No Causality
ER does not Granger cause VAR	5.07	0.00	Unidirectional causality from
VAR does not Granger cause ER	1.21	0.31	ER to VaR
IR does not Granger cause VAR	1.49	0.22	Unidirectional causality from
VAR does not Granger cause IR	2.87	0.04	VaR to IR
ER does not Granger cause interest rate	3.91	0.01	Directional causality from
Interest rate does not Granger cause ER	5.09	0.00	interest rate to exchange rate
IR does not Granger cause interest rate	2.77	0.05	Unidirectional causality from
Interest rate does not Granger Cause IR	1.33	0.27	inflation rate to interest rate
IR does not Granger Cause ER	1.72	0.17	
ER does not Granger Cause IR	1.36	0.26	No Causality

4.4.4 Vector Error Correction Model (VECM)

The results for VECM were summarized as shown in Table 4.11 in appendix, from Table 4.11 there was a Value-at-Risk was significantly influenced by Value-at-Risk lagged for one period, Value-at-Risk lagged for two periods, inflation rate lagged for two periods and interest rate lagged for three periods. In the first model 34% of the variations in Value-at-Risk were accounted for by VaR, interest rate, inflation rate and exchange when all were lagged up to three times.

In the second model, interest rate was significant influenced by interest rate lagged for three periods and exchange rate lagged for one period. In overall, when VaR, interest rate, exchange rate and inflation rate were lagged for three periods all had an explanatory power of 31%.

In the third model, exchange rate was significantly explained by Value-at-Risk lagged for one period, exchange rate lagged for one period and interest rate lagged for one period. In overall,

Value-at-Risk, exchange rate, interest rate and inflation rate all lagged for three periods explained 35% of the changes in exchange rate within the period under investigation.

In the fourth model of the simultaneous system, inflation was significantly explained by interest rate lagged for one period, Value-at-Risk lagged for two periods, interest rate lagged for two periods, and inflation rate lagged for one period and also when lagged for three periods. On overall, changes in inflation rate were explained by VaR, exchange rate, interest rate and inflation rate when they were all lagged for three periods to the tune of 58%.

4.4.5 Post Estimation Analysis

Moreover, post estimation was carried out as such to establish the model robustness in estimating the effect macroeconomic characteristics and VaR in Nairobi securities exchanges. Stability of the variance was tested using both graphical and tabular method. Results in Table 4.12 shows that there was stability of the characteristics polynomials since none of the modulus was greater than 1.

Table 4.12 Roots Characteristics of Polynomials

Root	Modulus
1	1
1	1
0.863132 - 0.156742i	0.877248
0.863132 + 0.156742i	0.877248
0.048085 - 0.673061i	0.674776
0.048085 + 0.673061i	0.674776
0.628452 - 0.210819i	0.66287
0.628452 + 0.210819i	0.66287
-0.042511 - 0.575731i	0.577298
-0.042511 + 0.575731i	0.577298
-0.43852	0.438516
-0.19675	0.196754
VEC specification imposes 2 unit root(s).	

4.4.6 Impulse Response Analysis

Further, the study adopted both impulse response and variance decomposition to check on the cointergration test of the study findings. This was followed by Cholesktype one SD innovations, this assumes that prior behaviour of a variables influences future patterns. The pictorial presentation in Figure 4.6 shows that Value-at-Risk response to shocks of interest rate, exchange rate and inflation, in the initial periods VaR had negative response to exchange rate and inflation rate though the trend changed to be positive throughout the remaining. It is important to that the initial response to inflation rate was higher than exchange rate though the trend was reversed. Moreover, it maintained positive response to interest throughout the period under investigations.

Secondly, the response interest rate was below zero throughout the period under investigation and it had wide fluctuations which were mostly noted between VaR and inflation rate. Thirdly, interest rate had less than zero response to exchange rate through the period under investigation. Although, it had negative response initially to VaR the trend changed to be positive and increased with change in period and at the end it was lower. Finally, inflation rate maintained downward trend response through the period under investigation and it was negative in the longest period.

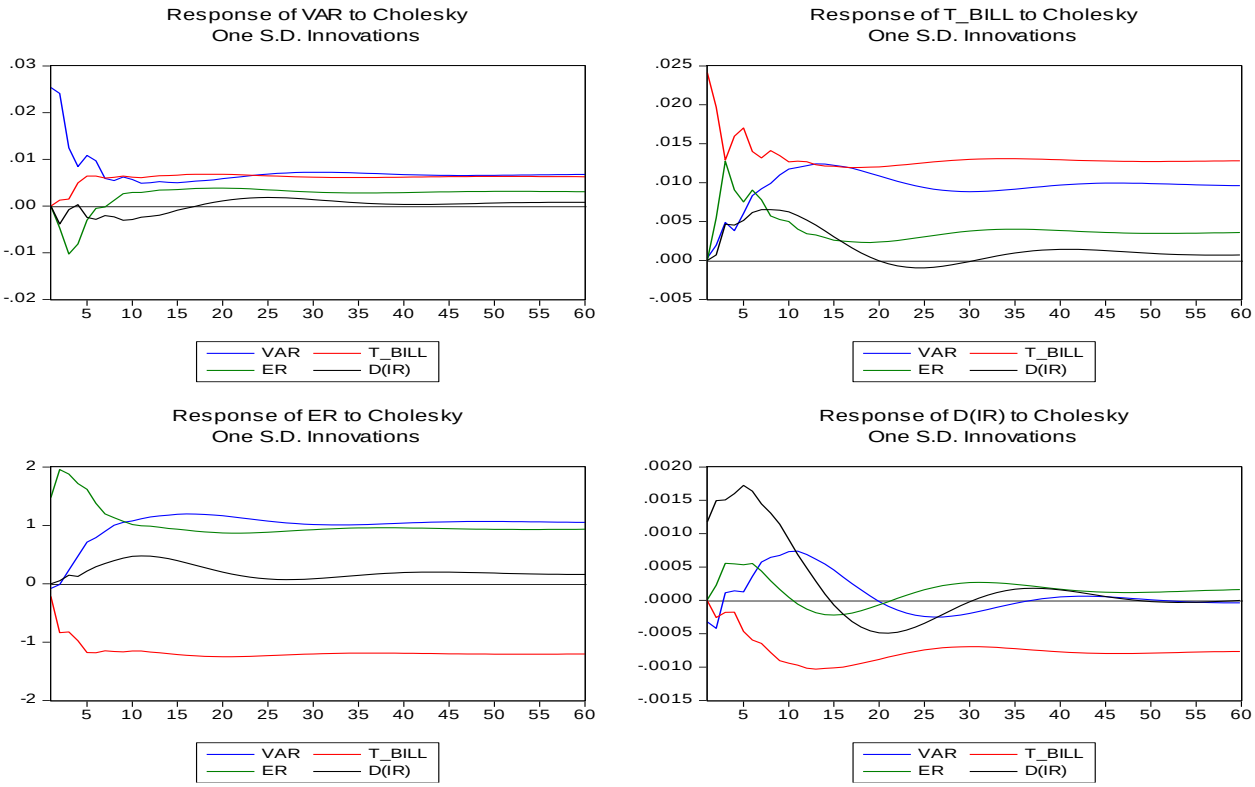

Figure 4.6 Impulse Response

4.4.7 Variance Decomposition

Finally, variance decomposition was carried out to evaluate the proportions of shocks in VaR that could be accounted to interest rate, inflation and exchange rate and consequently examine their value contribution in determination of VaR in Nairobi securities exchange. The following observations can be made from Figure 4.7; the variance on the VaR is due to its own shocks which commenced at 100% and then registered a downward trajectory throughout the period under investigation. Moreover, the variations attributed to other factors was zero initially and then it increased as the period increased though the shock from interest rate was so negligible and it had the least impact throughout the period under investigation.

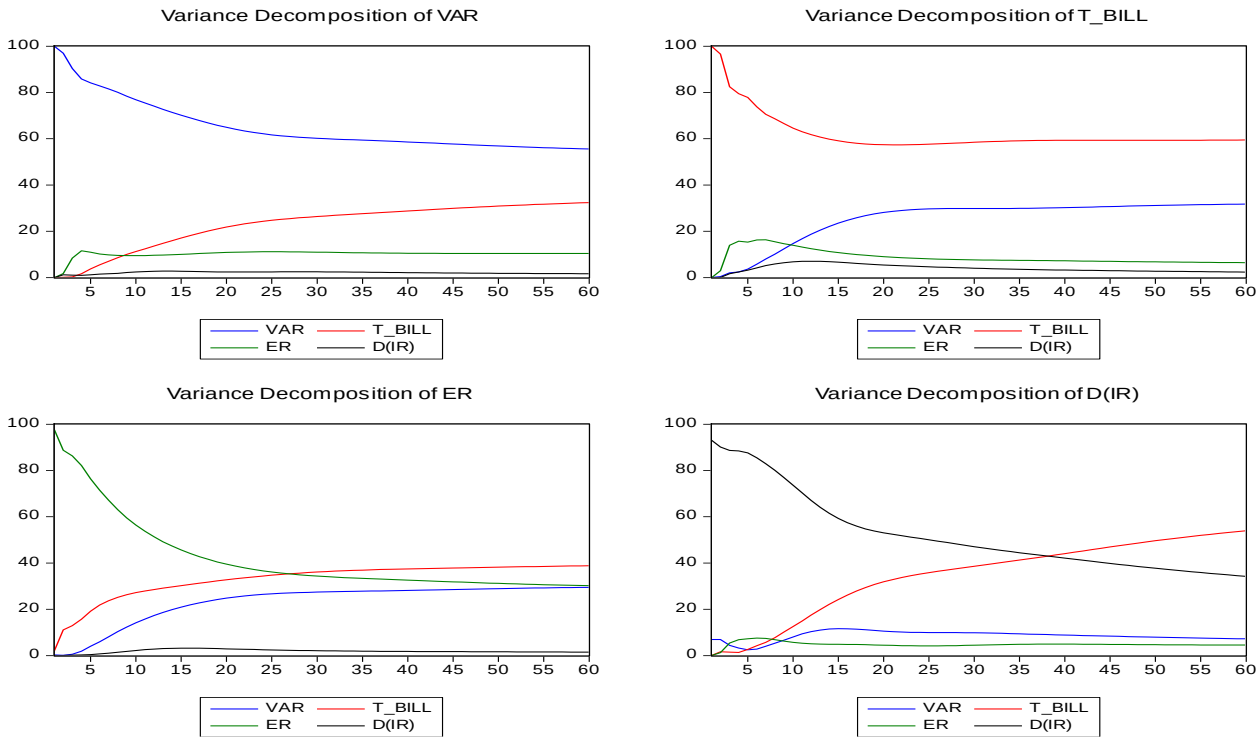

Figure 4.7 Variance Decomposition

CHAPTER FIVE

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter present the discussions of the findings in relation to the past studies where even conclusions are drawn. At the end, the researcher makes recommendations based on the findings as well as citing other avenue where further study can be conducted.

5.2 Discussions and Conclusions

Investment opportunities ought to be well assessing before full commitment of the investors capital. Viability of the investment depend on how correct is the level of risk exposure. The interaction between various macroeconomic variables and risk has substantial effects on market capitalization and company valuations. In this connection, the study sought to determine the effects between macroeconomic variables and VaR. This was generally needed since the government of Kenya has always focused on promoting investment by developing economic policies suitable for investors.

Owing to the violations of linear regression model and data being time series in nature, the study used time series analysis thus necessitating test for stationarity was done by use of Augmented Dickey Fuller Test (ADF).All the study variables were tested and the resulted revealed absence of stationarity in the four variables (inflation rate, exchange rates, interest rates and VaR). This further demanded for differentiation in first order. Apart from inflation rate, all the other variables were stationary when unit root test was applied. Moreover, a differentiation of the second order was imperative. At the integration of the second order all variables were thus found to be stationary.

Having integrated the variables into second order it was considered fit to test cointegration. This was done via Johansen Cointergration test which is favourite when examining multivariate and concurrent cointegration of variables. This would also help substantiate long and short run differences between variables. With the help of Trace statistics, significance of eigen values estimates was also tested. The study established that there exist one Cointergration equation between Value-at-Risk, exchange rate, inflation rate and interest rate. At 5 percent level of significance, Trace statistics showed one cointergration that implied a long run relationship between VaR and the macroeconomic variables.

Based on the objectives of the study, analysis was done through the use of impulse responses functions and variance decomposition. As revealed the study showed that Value-at-Risk responded to shock of the interest rate, exchange rate and inflation rate. Use of impulse responses was demanded since they help to estimate the connection between current and any past error terms of the study variables, both the explanatory and predictor variables (Stock, 2001).

The first research questions sought to search for the effect of inflation on Value-at-Risk of stocks listed at Nairobi Securities Exchange. A regression of VaR on inflation from the impulse responses demonstrated insignificant effect of inflation on stocks VaR. This contradicts the findings of the Ibrahim and Aziz (2003) who had earlier found that trio microeconomic variables had a significant impact on stock prices. This was further postulated by Patra and Poshakwale (2006) in republic of Greece who found that money supply and quantity of trading had a significant effect on the price index.

On the second research question which sought to examine the effect of exchange rate on VaR of stocks listed at Nairobi Securities Exchange, Vector Error Correction Model (VECM) was used. The impulse response revealed that the exchange rate had no significant effect on stock VaR.

These findings contrasted Phylaktis and Ravazzalo (2005) who found a positive significant relationship between foreign exchange and US stock market. Although, there was no long run relationship, Tabak (2005) found significant granger causality in Brazil. The results differed with studies carried out in US stock market since the economy is developed and is more dependent on exporting rather than Kenyan economy which imports a lot thus more dependent on exchange rate which can influence performance negatively.

In line with the last research question which sought to examine the effect of interest rate on VaR of stocks listed at Nairobi Securities Exchange, ADF proved interest rate to be stationary at the first difference. According to impulse response analysis, interest rate was seen to have positive effect on the Value-at-Risk of the listed stock. Conversely, as argued by Lipsey and Chrystal (2007) that high interest rate should decrease the demand while low interest rate stimulates growth in demand of goods and services in the economy. This could be explained by fact that interest rates play a major role in enhancing control of inflation which helps to contain money supply (Saborowski & Weber, 2013). A negative impact of interest rates on stock VaR was found by Alman and Udin (2009) in their Malasyian study.

5.3 Policy Implications

5.3 Areas of Future Research

In future there is need to evaluate qualitative aspects which could be influencing investment decisions since most of them may be influenced by the levels of risk exposure. From this study it will be possible to evaluate the psychological attributes which could be influencing the levels of risk exposure among investment choices.

Secondly, there are tremendous stages which are being pursued towards East Africa economic integration. This call for an examination of the effect of inflation, interest rate, exchange rate in

Value-at-Risk in East Africa. This will enhance the understanding on the sensitivity of economic variables within and how they are influencing Value-at-Risk.

Thirdly, there is need of an enquiry on the effect of other macroeconomic characteristics on Value-at-Risk in Kenya and more so alternative measurement of risk can be adopted. Further, an evaluation of economic stress (difference between actual and forecasted estimates) on Value-at-Risk is a gap which deserves to be documented empirically.

Policy Implications

Risk management is an area of interest for many and in particular investors in the listed companies where there is paucity of information. Companies are also required to set aside some capital to cater for the market risk to cushion against any loss that may occur. This demand the right techniques of predicting the risk.

The connection between the three macroeconomic factors is clear indication the policy maker needs to put into consideration before taking any action or decision on the policy themselves.

The researcher hopes that results contained herein will serve as an eye opener to theorist and empirists on the suitability of VaR in constructing test for the price volatility of the companies listed in the NSE.

Having assessed the effect of the trio macroeconomic factors, management stand in good position to benchmarking their decisions from the empirical evidence outlines and thus benefits in mitigation of both the market risk and non-systematic risks facing their companies. Capital market regulator too will find this study useful especially when formulating policies that can enable smooth trading.

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APPENDIX

Appendix I Results of the Study

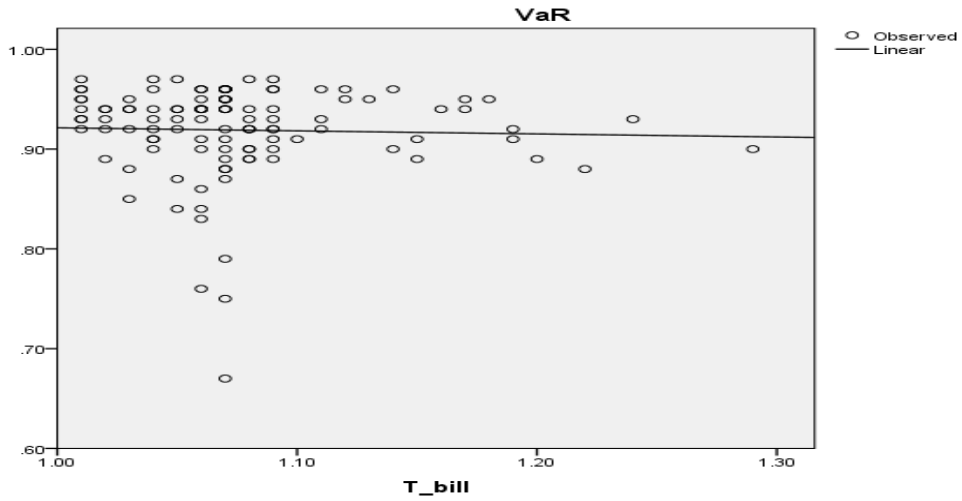

Figure 4.1a Interest Rate Versus VaR

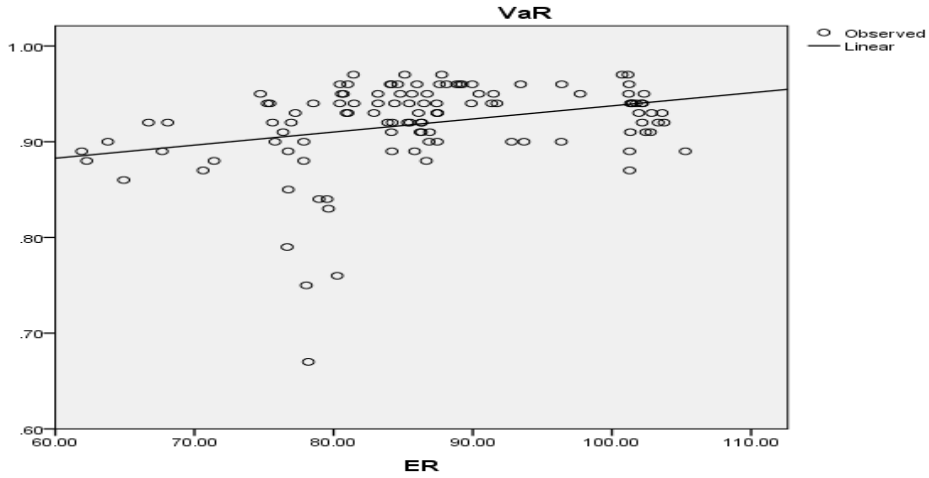

Figure 4.1b Exchange Rate versus VaR

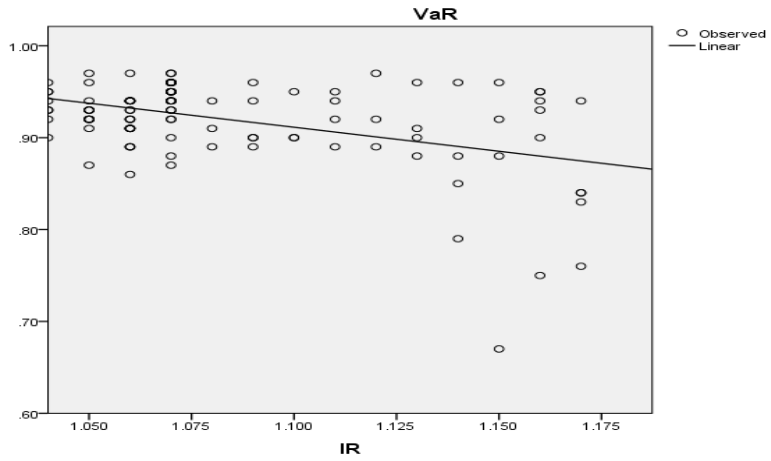

Figure 4.1c Inflation Rate versus VaR

Vector Error Correction Model (VECM) Results

System: UNTITLED
Estimation Method: Least Squares
Sample: 2008M06 2017M04
Included observations: 107

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.143	0.070	-2.050	0.041
C(2)	0.065	0.035	1.857	0.064
C(3)	0.040	0.116	0.343	0.732
C(4)	-0.293	0.106	-2.769	0.006
C(5)	0.033	0.112	0.297	0.766
C(6)	-0.043	0.112	-0.380	0.704
C(7)	-0.186	0.113	-1.647	0.101
C(8)	0.072	0.111	0.652	0.515
C(9)	-0.003	0.002	-2.008	0.045
C(10)	-0.003	0.002	-1.570	0.117
C(11)	0.001	0.002	0.394	0.694
C(12)	-2.733	1.918	-1.425	0.155
C(13)	3.833	1.956	1.960	0.051
C(14)	-0.188	1.887	-0.100	0.921
C(15)	0.003	0.003	1.015	0.311
C(16)	0.041	0.066	0.620	0.536
C(17)	-0.018	0.033	-0.538	0.591
C(18)	0.045	0.111	0.410	0.682
C(19)	0.141	0.101	1.397	0.163
C(20)	-0.070	0.106	-0.656	0.512

C(21)	-0.132	0.107	-1.235	0.217
C(22)	-0.154	0.108	-1.430	0.154
C(23)	0.190	0.105	1.797	0.073
C(24)	0.004	0.002	2.300	0.022
C(25)	0.005	0.002	2.503	0.013
C(26)	-0.002	0.002	-1.223	0.222
C(27)	0.428	1.825	0.235	0.815
C(28)	3.224	1.861	1.733	0.084
C(29)	-0.728	1.795	-0.406	0.685
C(30)	-0.003	0.002	-1.057	0.291
C(31)	11.930	4.104	2.907	0.004
C(32)	-4.679	2.065	-2.266	0.024
C(33)	-7.346	6.862	-1.071	0.285
C(34)	-0.385	6.230	-0.062	0.951
C(35)	-0.157	6.578	-0.024	0.981
C(36)	-18.239	6.621	-2.755	0.006
C(37)	9.024	6.659	1.355	0.176
C(38)	-8.501	6.533	-1.301	0.194
C(39)	0.356	0.102	3.493	0.001
C(40)	-0.033	0.113	-0.295	0.768
C(41)	0.089	0.101	0.875	0.382
C(42)	-26.816	113.019	-0.237	0.813
C(43)	15.390	115.231	0.134	0.894
C(44)	-33.527	111.182	-0.302	0.763
C(45)	0.234	0.154	1.522	0.129
C(46)	0.006	0.003	1.698	0.090
C(47)	-0.006	0.002	-3.381	0.001
C(48)	-0.006	0.006	-0.988	0.324
C(49)	0.016	0.005	3.185	0.002
C(50)	-0.009	0.005	-1.615	0.107
C(51)	-0.003	0.005	-0.633	0.527
C(52)	0.015	0.005	2.819	0.005
C(53)	0.007	0.005	1.223	0.222
C(54)	0.000	0.000	1.571	0.117
C(55)	0.000	0.000	1.687	0.093
C(56)	0.000	0.000	-0.491	0.623
C(57)	0.342	0.092	3.701	0.000
C(58)	0.009	0.094	0.095	0.924
C(59)	0.244	0.091	2.689	0.008
C(60)	0.000	0.000	-1.136	0.257

Determinant residual covariance		6.20E-13		
Equation: D(VAR) = C(1)*(VAR(-1) - 0.00615869078792*ER(-1) +				
17.7202663904*D(IR(-1)) - 0.383067931682) + C(2)*(T_BILL(-1) -				
0.00883710047235*ER(-1) + 30.3736734214*D(IR(-1)) -				
0.305019844952) + C(3)*D(VAR(-1)) + C(4)*D(VAR(-2)) + C(5)*D(VAR(				
-3)) + C(6)*D(T_BILL(-1)) + C(7)*D(T_BILL(-2)) + C(8)*D(T_BILL(-3)) +				
C(9)*D(ER(-1)) + C(10)*D(ER(-2)) + C(11)*D(ER(-3)) + C(12)*D(IR(				
-1),2) + C(13)*D(IR(-2),2) + C(14)*D(IR(-3),2) + C(15)				
Observations: 107				
R-squared	0.339408	Mean dependent var		0.000305
Adjusted R-squared	0.238883	S.D. dependent var		0.029081
S.E. of regression	0.025371	Sum squared resid		0.059219
Durbin-Watson stat	1.948497			
Equation: D(T_BILL) = C(16)*(VAR(-1) - 0.00615869078792*ER(-1) +				
17.7202663904*D(IR(-1)) - 0.383067931682) + C(17)*(T_BILL(-1) -				
0.00883710047235*ER(-1) + 30.3736734214*D(IR(-1)) -				
0.305019844952) + C(18)*D(VAR(-1)) + C(19)*D(VAR(-2)) + C(20)				
*D(VAR(-3)) + C(21)*D(T_BILL(-1)) + C(22)*D(T_BILL(-2)) + C(23)				
*D(T_BILL(-3)) + C(24)*D(ER(-1)) + C(25)*D(ER(-2)) + C(26)*D(ER(-3))				
+ C(27)*D(IR(-1),2) +				

C(28)*D(IR(-2),2) + C(29)*D(IR(-3),2) + C(30)				
Observations: 107				
R-squared	0.305201	Mean dependent var		-0.00022
Adjusted R-squared	0.199471	S.D. dependent var		0.026974
S.E. of regression	0.024135	Sum squared resid		0.053588
Durbin-Watson stat	2.071173			
Equation: D(ER) = C(31)*(VAR(-1) - 0.00615869078792*ER(-1) +				
17.7202663904*D(IR(-1)) - 0.383067931682) + C(32)*(T_BILL(-1) -				
0.00883710047235*ER(-1) + 30.3736734214*D(IR(-1)) -				
0.305019844952) + C(33)*D(VAR(-1)) + C(34)*D(VAR(-2)) + C(35)				
*D(VAR(-3)) + C(36)*D(T_BILL(-1)) + C(37)*D(T_BILL(-2)) + C(38)				
*D(T_BILL(-3)) + C(39)*D(ER(-1)) + C(40)*D(ER(-2)) + C(41)*D(ER(-3))				
+ C(42)*D(IR(-1),2) + C(43)*D(IR(-2),2) + C(44)*D(IR(-3),2) + C(45)				
Observations: 107				
R-squared	0.345216	Mean dependent var		0.387159
Adjusted R-squared	0.245575	S.D. dependent var		1.720825
S.E. of regression	1.494668	Sum squared resid		205.5311
Durbin-Watson stat	1.983989			
Equation: D(IR,2) = C(46)*(VAR(-1) - 0.00615869078792*ER(-1) +				
17.7202663904*D(IR(-1)) - 0.383067931682) + C(47)*(T_BILL(-1) -				

0.00883710047235*ER(-1) + 30.3736734214*D(IR(-1)) -				
0.305019844952) + C(48)*D(VAR(-1)) + C(49)*D(VAR(-2)) + C(50)				
*D(VAR(-3)) + C(51)*D(T_BILL(-1)) + C(52)*D(T_BILL(-2)) + C(53)				
*D(T_BILL(-3)) + C(54)*D(ER(-1)) + C(55)*D(ER(-2)) + C(56)*D(ER(-3))				
+ C(57)*D(IR(-1),2) + C(58)*D(IR(-2),2) + C(59)*D(IR(-3),2) + C(60)				
Observations: 107				
R-squared	0.577905	Mean dependent var		-8.79E-05
Adjusted R-squared	0.513673	S.D. dependent var		0.001751
S.E. of regression	0.001221	Sum squared resid		0.000137
Durbin-Watson stat	2.065607			

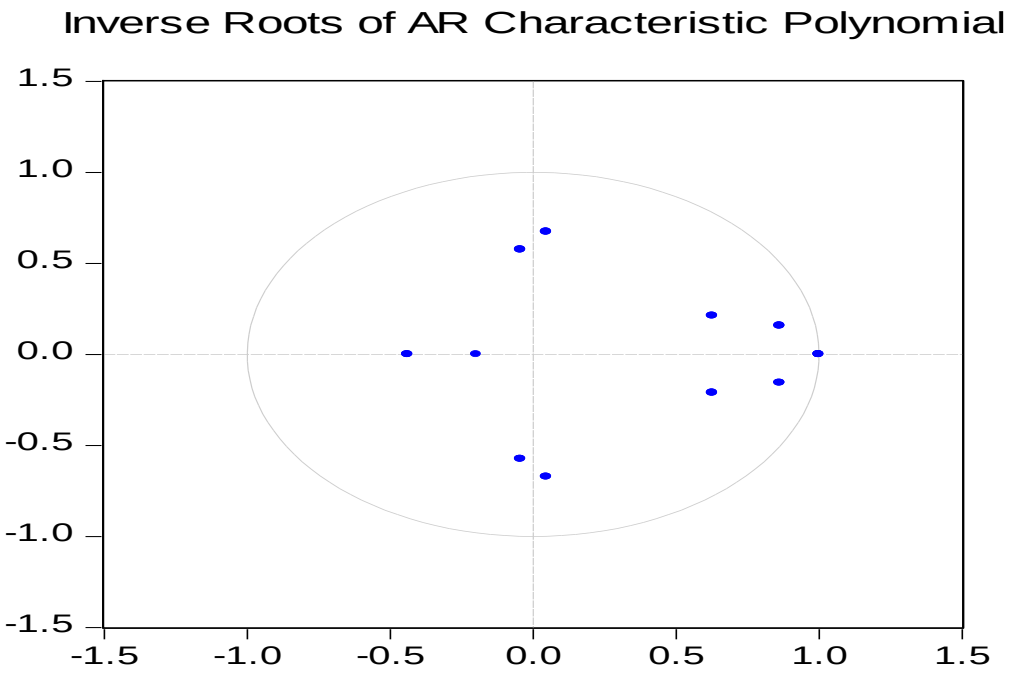

Figure 4.5 Roots of Characteristics Polynomial

Appendix I Sample of Listed Companies in Nairobi Securities Exchange

AGRICULTURAL	**TELECOMMUNICATION AND**
Eaagads Ltd	**TECHNOLOGY**
Kapchorua Tea Co. Ltd	Access Kenya Group Ltd
Kakuzi	Safaricom Ltd
Limuru Tea Co. Ltd	**AUTOMOBILESN AND ACCESSORIES**
Rea Vipingo Plantations Ltd	Car and General (K) Ltd
Sasini Ltd	Sameer Africa Ltd
Williamson Tea Kenya Ltd	Marshalls (E.A.) Ltd
COMMERCIAL AND SERVICES	
Express Ltd	**BANKING**
Kenya Airways Ltd	Barclays Bank Ltd
Nation Media Group	CFC Stanbic Holdings Ltd
Standard Group Ltd	Diamond Trust Bank Kenya Ltd
TPS Eastern Africa (Serena) Ltd	Housing Finance Co Ltd
Scangroup Ltd	Kenya Commercial Bank Ltd
Uchumi Supermarket Ltd	National Bank of Kenya Ltd
Hutchings Biemer Ltd	NIC Bank Ltd
Longhorn Kenya Ltd	Standard Chartered Bank Ltd
INSURANCE	Equity Bank Ltd
Jubilee Holdings Ltd	The Co-operative Bank of Kenya Ltd
Pan Africa Insurance Holdings Ltd	**MANUFACTURING AND ALLIED**
Kenya Re-Insurance Corporation Ltd	B.O.C Kenya Ltd
CFC Insurance Holdings	British American Tobacco Kenya Ltd
British-American Investments Company (Kenya)	Carbacid Investments Ltd
Ltd	East African Breweries Ltd
CIC Insurance Group Ltd	Mumias Sugar Co. Ltd
INVESTMENT	Unga Group Ltd
City Trust Ltd	Eveready East Africa Ltd
Olympia Capital Holdings ltd	Kenya Orchards Ltd
Centum Investment Co Ltd	A.Baumann CO Ltd
Trans-Century Ltd	**ENERGY AND PETROLEUM**
CONSTRUCTION AND ALLIED	Kenol Kobil Ltd

Athi River Mining	Total Kenya Ltd
Bamburi Cement Ltd	KenGen Ltd
Crown Berger Ltd	Kenya Power & Lighting Co Ltd
E.A.Cables Ltd	
E.A.Portland Cement Ltd	

Source; *www.nse.co.ke*

	AGRICULTURAL		ENERGY & PETROLEUM
1	Eaagads Ltd Ord 1.25 AIMS	41	KenGen Co. Ltd Ord. 2.50
2	Kakuzi Ltd Ord.5.00	42	KenolKobil Ltd Ord 0.05
3	Kapchorua Tea Co. Ltd Ord Ord 5.00AIMS	43	Kenya Power & Lighting Co Ltd Ord 2.50
4	The Limuru Tea Co. Ltd Ord 20.00AIMS	44	Total Kenya Ltd Ord 5.00
5	Sasini Ltd Ord 1.00	45	Umeme Ltd Ord 0.50
6	Williamson Tea Kenya Ltd Ord 5.00AIMS		
			INSURANCE
	AUTOMOBILES & ACCESSORIES	46	Britam Holdings Plc Ord 0.10
6	Car & General (K) Ltd Ord 5.00	47	CIC Insurance Group Ltd Ord.1.00
7	Sameer Africa Ltd Ord 5.00	48	Jubilee Holdings Ltd Ord 5.00
		49	Kenya Re Insurance Corporation Ltd Ord 2.50
	BANKING	50	Liberty Kenya Holdings Ltd Ord. 1.00
8	Barclays Bank of Kenya Ltd Ord 0.50	51	Sanlam Kenya Plc Ord 5.00
9	Diamond Trust Bank Kenya Ltd Ord 4.00		
10	Equity Group Holdings Ltd Ord 0.50		INVESTMENT
11	Housing Finance Group Ltd Ord 5.00	52	Centum Investment Co Plc Ord 0.50
12	I&M Holdings Ltd Ord 1.00	53	Home Afrika Ltd Ord 1.00GEMS
13	KCB Group Ltd Ord 1.00	54	Kurwitu Ventures Ltd Ord 100.00GEMS
14	National Bank of Kenya Ltd Ord 5.00	55	Olympia Capital Holdings Ltd Ord 5.00
15	NIC Bank Ltd Ord 5.00	56	Trans-Century Ltd Ord 0.50AIMS
16	Stanbic Holdings Plc ord.5.00		
17	Standard Chartered Bank Kenya Ltd Ord 5.00		INVESTMENT SERVICES
18	The Co-operative Bank of Kenya Ltd Ord 1.00	57	Nairobi Securities Exchange Ltd Ord 4.00
	COMMERCIAL AND SERVICES		MANUFACTURING & ALLIED
19	Atlas African Industries LtdGEMS	58	A.Baumann & Co Ltd Ord 5.00AIMS
20	Deacons (East Africa) Plc Ord 2.50AIMS	59	B.O.C Kenya Ltd Ord 5.00
21	Eveready East Africa Ltd Ord.1.00	60	British American Tobacco Kenya Ltd Ord 10.00
22	Express Kenya Ltd Ord 5.00AIMS	61	Carbacid Investments Plc Ord 1.00
23	Hutchings Biemer Ltd Ord 5.00	62	East African Breweries Ltd Ord 2.00
24	Kenya Airways Ltd Ord 5.00	63	Flame Tree Group Holdings Ltd Ord 0.825GEMS
25	Longhorn Publishers Ltd Ord 1.00AIMS	64	Kenya Orchards Ltd Ord 5.00AIMS
26	Nairobi Business Ventures Ltd Ord. 1.00GEMS	65	Mumias Sugar Co. Ltd Ord 2.00
27	Nation Media Group Ltd Ord. 2.50	66	Unga Group Ltd Ord 5.00
28	Standard Group Ltd Ord 5.00		
29	TPS Eastern Africa Ltd Ord 1.00		TELECOMMUNICATION
30	Uchumi Supermarket Ltd Ord 5.00	67	Safaricom Ltd Ord 0.05
31	WPP Scangroup Ltd Ord 1.00		
	CONSTRUCTION & ALLIED		
32	ARM Cement Plc Ord 1.00		
34	Bamburi Cement Ltd Ord 5.00		
36	Crown Paints Kenya Ltd Ord 5.00		
38	E.A.Cables Ltd Ord 0.50		
40	E.A.Portland Cement Co. Ltd Ord 5.00		