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Influence of Selected Macroeconomic Factors on Stock Market Performance in Kenya

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Abstract

Stock markets are crucial in promoting growth and development of any country. However, several stock markets around the world continue to produce mixed results. The literature suggests that different variables are potentially important in explaining the variations in stock performance beyond a single market facto. Using the Nairobi Securities Exchange case, this research aimed to assess the macroeconomic factors influencing stock market performance in Kenya. The research was guided by four particular goals: to determine the impact of exchange rate on stock market performance in Kenya; to determine the impact of interest rate on stock market performance; to determine the impact of inflation on stock market performance and to determine the impact of money supply on stock market performance in Kenya. The literature was directed by the Arbitrage Pricing theory, the Capital Asset Pricing Model and the Theory of Efficient Market Hypothesis. A multivariate time series econometric design was adopted to establish the direction and magnitude of the relationships. The target population was the Nairobi Stock Exchange stock prices data and statistical data from Nairobi Securities Exchange, Central Bank of Kenya, and from Kenya National Bureau of Statistics. Average monthly Nairobi Securities Exchange All Share Price Index, Exchange rate of the Kenyan Shillings against the United States dollar, the Consumer Price Index, the Commercial banks' lending rate and the broad Money supply were the data used for a period starting from 2008 to 2017. Diagnostic and model specification tests were performed on the data using E-Views version 7. The Hausman test showed that the random-effects model is suitable to be used for our study. The Normality test showed that the disturbance term was almost same as being normal. The series were found to be stationary at first difference and not at level. The data were treated of the serial correlation problem and suitable model was chosen. An unrestricted vector autoregressive model was used to model the relationship between the dependent variable and the explanatory variables. Results based on the VAR output were interpreted. The research discovered that the four independent variables represented by the adapted

R2 explain 87.9 percent of the variation in the dependent variable. All the independent variables were shown to be statistically significant. The results of the regression revealed that lagged Exchange rates have a long run negative effect on the stock market performance as well as the Interest Rate and Inflation, but Money Supply showed to have a long run positive effect on the Stock Market performance in Kenya. The study recommends that Kenyan regulators should continue trying to find all possible means to adjust levels of the concerned macroeconomic factors (Exchange rates, Interest rates, Inflation and Money supply) in order to improve the performance of the Kenyan Stock Market. The study further suggested more research to be carried out in order to bring more knowledge to the literature by including more macroeconomic variables and an extended period of time or by using a different research design.
Keywords: *Exchange Rate, Inflation, Interest Rate, Money Supply, Performance and Kenyan Stock Market*

1.0 Introduction

1.1 Background of the Study

A country's economic growth depends primarily on its financial sector's development. Stock market is a crucial player in the economic industry and offers a platform for economic resource consumers and vendors to invest in corporate shares (Kashif, 2014). A well-functioning and sound stock market prefers productive firms ' shares and values more than successful firms' shares. According to Zeitun, Kian and Teen (2007), the macroeconomic factors have great impact on the financial results recorded by firms across the world. They determine how organizations conduct their business to ensure that they remain competitive in changing macroeconomic settings. For instance, monetary policy has an impact on all companies as it determines the cost of capital and the accessibility of credit facility to companies. This in turn could affect the accessibility of fund to companies. When company has to grapple with high cost of capital and limited credit facility, its financial results will be greatly hampered.

The fiscal policy allows the government to observe and influence the economy by regulating spending limits and tax rates. In other words, this is how the government affects the economy. Monetary policy includes the process of developing, announcing and implementing the action plan adopted by the Central Bank, the Currency Council or any other competent monetary authority in a country that controls the amount of money in the economy and the channels through which the new currency is provided. Monetary policy is to manage money supply and interest rates to achieve macroeconomic goals such as regulatory inflation, consumption, growth and liquidity. Monetary policy tries to complete a set of objectives expressed in terms of macroeconomic variables such as inflation, real production and employment. However, monetary policy measures such as changing the discount rate of the central bank have an indirect influence on variables, and the policy transfer mechanism takes time. (Christos & Alexandros, 2006). And also, monetary policy is expected to affect the asset prices throughout the year (Bernanke and Kuttner, 2005).

In the developing nations (Brazil, Russia, India and China), Gay (2008) did not establish any important correlation between the corresponding exchange rate and the oil price on the stock market index price. Mohammed (2011) discovered a adverse connection between stock returns and inflation as well as overseas remittances while Bangladesh's market price/ earnings and market

capitalization development had a beneficial impact on stock returns. Serkan (2008) found that the exchange rate, the interest rate and the global market performance seem to affect the overall performance of the portfolio, while the inflation rate is significant for only three of the twelve portfolios. Moreover, industrial production, money supply and oil prices do not seem to have a major impact on equity performance in Turkey.

In Africa, macroeconomic factors play a great role towards the overall performance of stock markets. In 2000, Jefferis and Okeahalam found in their research that national economic growth controlled stock markets and observed that internal financial variables had no common patterns. In Ghana, Muazu and Alhassan (2014) provided proof of a long-term connection between macroeconomic factors and stock returns, and their outcome showed that shocks on inflation, money supply, and exchange rates do not explain a substantial percentage of inventory return variance mistake, but that their impact persists over a long period of time.

In Kenya, available studies show a divided opinion among scholars on the effect of macroeconomic factors on performance of stock market. In his study, Kung'u (2013) established that macroeconomic variables had the greatest positive effect on performance of firms at the NSE. Muinde (2017) examined effect of macroeconomic instability on price of shares at the NSE and established that inflation outweighed benefits from money supply in the long-run. On the other hand, findings of the studies conducted by Ouma and Muriu (2014) and Ochieng and Oriwo (2012) contradicted previous scholars when they revealed that there exists harmful long duration stability among money supply and stock prices. Gatuhi (2015) found that the type of sector characteristics had a moderating effect on the relationship between macroeconomic variables and the stock market performance. Similarly, Njau (2013) established that GDP, inflation and interest rates had greatest impact of firm performance while exchange rates showed a negative relationship that was not significant. Ochieng and Adhiambo (2012) indicated that 91-day T-bill rate had a negative relationship with the NASI while inflation has weak positive relationship with the NASI.

The Nairobi Securities Exchange (NSE) was set up as the Nairobi Stock Exchange, the capital of Kenya, based in Nairobi in 1954. It was a voluntary association of stock brokers registered in British Kenya within the European community under the Societies Act. The NSE is regulated by Capital Markets Authority (CMA) which is the Government Regulator charged with licensing and regulating the capital markets in Kenya. It also approves public offers and listings of securities traded at the Nairobi Stock Exchange. The NSE is also endorsed by the Central Depository and Settlement Corporation (CDSC), which offers securities traded on the Exchange for clearing, distribution and settlement services. It oversees the behavior of Central Depository Agents consisting of stockbrokers and investment banks that are NSE and Custodians participants (CDSC, 2004).

1.2 Statement of the Problem

There is a sharp divided opinion among scholars on whether macroeconomic factors affect stock market performance. Some scholars argue that macroeconomic factors have a positive impact on the stock market, while others have a negative relationship between macroeconomic factors and stock market performance. For instance, in his study, Kung'u (2013) established that macroeconomic variables had the greatest positive effect on performance of firms at the NSE.

Muinde (2017) examined effect of macroeconomic instability on price of shares at the NSE and established that inflation outweighed benefits from money supply in the long-run. On the other hand, findings of the studies conducted by Ouma and Muriu (2014) and Ochieng and Oriwo (2012) contradicted previous scholars when they revealed that there exists harmful long duration stability among money supply and stock prices. Similarly, Njau (2013) looked at the specific macroeconomic factors influencing the profitability of private equity companies that exist in Kenya and established that GDP, inflation and interest rates had greatest impact of firm performance while exchange rates showed a negative relationship that was not significant.

In addition, majority of the available studies are based in different countries with different operating macroeconomic variables from Kenya hence limiting the application of their findings in the current study scenario. The few available studies are generalized and ever since they were done, Kenya has policy changes including introduction of interest rate capping. The present research attempted to fill this gap by examining the macroeconomic factors influencing the performance of the stock market using Nairobi Securities Exchange.

1.3 Objectives of the Study

(i) To determine the impact of the exchange rate on the performance of the Kenyan stock market
(ii) To determine the impact of inflation on the performance of the Kenyan stock market.
(iii) To determine the impact of the interest rate on the performance of the Kenyan stock market
(iv) To assess the mediating effect of the money supply on the performance of the Kenyan stock market

1.4 Research Hypotheses

(i) Ho1: Exchange rate has no statistically significant effect on the stock market performance
(ii) Ho2: Interest rate has no statistically significant effect on the stock market performance
(iii) Ho3: Inflation has no statistically significant effect on the stock market performance
(iv) Ho4: Money Supply has no statistically significant effect on the stock market performance

2.0 Literature Review

2.1 Theoretical Framework

2.1.1 Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory employs macroeconomic or fundamental factors in the pricing of financial assets. These factors are weighed by factor loading which is the beta coefficient sensitivities (Otweyo, 2014). The arbitrage pricing theory (APT) was proposed by Ross in 1976. APT specifies how the expected return on an investment change in response to other factors and the sensitivity the investment has to that factor. Ross (1976) used the ATP model during his study on the American stock market return. He focused on the main seven macroeconomic factors such as industrial production, risk premium, inflation, market return, consumption and oil price and established a significant positive relationship between the macroeconomic variables and stock market return. Further, the study revealed that macroeconomic factors had a significant impact on industrial production, changes in risk premium, and twist in the yield curve. APT is hinged on the fact that the absence of arbitrage by extension implies a near linear relationship between the expected returns and the betas of various risk factors (Shanken, 1992).

Arbitrage Pricing Theory was considered appropriate in the current study because it explains how investors can predict and extrapolate the financial performance of an organization based on the prevailing macroeconomic variables.

2.1.2 Capital Asset Pricing Model

The advocates of Capital Asset Pricing Model (CAPM) are Sharpe (1964) and Lintner (1965). The Capital Asset Pricing Model is used in pricing risky securities by putting into consideration the time value of money as signified by the risk-free rate of a market portfolio and the returns derived from the riskiness of the particular investment. A risk measure i.e. beta is a ratio of the returns of the particular asset to that of the market portfolio over a duration of time and finally this ratio multiplied by the market premium gives the additional risk component (Sharpe, 1964 and Lintner 1965).

$Ra = Rf + \beta a(Rm - Rf\ )$

Where,

Rf = Risk Free Rate

βa = Beta of the security.

Rm = Expected Market Return.

Ra = Expected Return of the Security.

The CAPM was a basic technique used to determine risk and performance related to a particular security, the single factor model was the main characteristic as well as the primary shortcoming of this model that was using only the market performance as a single factor to determine security performance. And that problem had led to alternative model to explain the stock performance variation called Arbitrage Pricing Theory (APT) which was developed as an alternative to CAPM. Multi-factor asset pricing models were predominantly based on the assumption that stock performance was affected by different economic factors. Financial information and macroeconomic variables could predict a notable portion of stock Performance.

2.1.3 Theory of Efficient Market Hypothesis

The fundamental idea behind the theory of Efficient Market Hypothesis (EMH) was developed by Eugene Fama (1970). According to theory, asset prices quickly reflect all available information, so that no abnormal profits can be produced regardless of the investment strategies used. Formally, the EMH can be explained using the following equation:

$\Omega t*=\Omega t$

All relevant information available to investors are represented by the left side of the equation at the time "t". The right side is all the information used in asset pricing at the time of "t". When these two aspects are equivalent that means that EMH is correct and the market is efficient. Fama (1970) gives three forms of market efficiency according to the level of information used by the market; the weak, semi-strong and strong form market efficiency from. Fama (1991) changed the three terms; weak form into predictable, the semi-strong into case studies and the strong form into internal information.

From an economic point of view, an effective stock market will help to distribute economic resources efficiently. For example, if the stock value of a financially poor company is not properly assessed, new savings will not be used in the industry with financial income. In the world of emerging markets at the environmental level, the level of asset price volatility or volatility reflects the fundamentals of economic fundamentals well. In this sense, Levich (2001) argues that policy

makers' interventions can disrupt the market and render it ineffective. In the literature, the three forms of EMH are generally used as guidelines rather than rigid facts (Fama, 1991). In addition, most empirical studies have studied EMH in their weak or semi-solid form, in part due to the difficulty of measuring the strong form and obtaining expensive information (Timmermann and Granger, 2004).

2.2 Empirical Review

2.2.1 Exchange Rate and Stock Market Performance

According to Akong'a (2014), the exchange rate is one currency's price to another country's. That implies that exchange rate has two components, the domestic or direct component, where the exchange rate is expressed based on domestic currency, and the foreign or indirect component where the currency is expressed in foreign currency terminologies. But, basically, most of the exchange rates are expressed in in terms of United States Dollar (USD) or in Euro (EUR) and others currencies such as British Pound (GBP).

Kutty (2010) explored the relationship between stock prices and Mexico's exchange rates. The data in this study included the Bolsa weekly closing, the Mexican stock index, and the weighted index of the stock market in the top 35-40 stocks. The Mexican peso was obtained for each US dollar from the first week of January 1989 until the last week of December 2006 from the International Monetary Market. After eliminating some inconsistent data, a total of 849 data points were created. Granger's causal test shows that stock prices generate short-term exchange rates and that there is no long-term relationship between these two variables. This result is consistent with the results of Bahmani *et al.* (1992), but contradicts the results of other studies indicating a long-term relationship between exchange rates and equity prices (Kutty, 2010).

Nancy (2017), attempted to investigate the effect on the Nairobi Securities Exchange of the real exchange rate. The research concentrated on the 20 share index of Nairobi Securities Exchange and the real exchange rate of Kenya shillings / US dollars. From 2001 to 2016, the research implemented easy regression (normal minimum squares) on sixteen-year information. The results suggested that there was a substantial real exchange rate and a positive correlation with the NSE Index.

2.2.2 Interest Rate and Stock Market Performance

A study by Joseph (2012) centered on the effect of foreign exchange and interest rate changes on UK firms in the chemical, electrical, engineering and pharmaceutical industries for the period of 1988 to 2000. The study used two different measures of foreign exchange rate, along with a measure of interest rate changes. The findings showed that sector performance was more negatively affected by interest rate changes than by foreign exchange rate changes. The negative effects of interest rate changes and foreign exchange rate changes appeared more evident for the electrical and engineering sectors whereas these effects were positive for the pharmaceutical sector. Additionally, the results at the portfolio-level were generally similar with those based on the firm-level analysis, except that the short term foreign exchange rate impact was very weak at the portfolio level (Joseph, 2012).

Pablo et al, (2014) used a wavelet-based strategy to investigate the connection between interest rate modifications and the Spanish market at the level of the sector over the period from January 1993 to December 2012. The empirical findings show that the Spanish companies show a substantial sensitivity to interest rates and the degree of exposure to interest rates varies

significantly across sectors and depends on the time horizon. The finding was consistent that long-term horizon investors are more probable in their investment choices to follow macroeconomic fundamentals, such as interest rates.

According to Miregi and Obere (2014) interest rate and inflation affect housing. Borrowing costs influence the disposable income of individuals which ultimately affect their purchasing power. When lending interest is low, more individuals can access bank financing which leads high demand hence increasing property prices.

2.2.3 Inflation and Stock Market Performance

Ng *et al* (2015) have examined the effect of selected variables on the Malaysian stock market performance from 1980 to 2013. The research applied several empirical test, and found that inflation has a positive relationship with Malaysian stock market performance, while Exchange rate, palm oil prices and election have a negative relationship with the Malaysian stock market performance. Also, Result from unit root test indicated that election is station at level and first difference while other variables were stationary at first difference. Lastly, Granger Causality Test and Johansen Co-Integration Test have been carried out to discover the short and long run relationship between the variables. Granger Causality Test found that the causality between stock market performance and election year does not exist.

A research by Mahedi (2012) examined the long-run connection between macroeconomic factors and short-run dynamics and stock returns in Germany and the United Kingdom. The research used the Johansen co-integration test to determine the co-integration of inventory prices and macroeconomic determinants. In addition, the study used error-correction models to examine both the short-and long-term casual relationships and each case is examined individually The results confirmed for Germany that the short-run causality ranges from stock returns to inflation, from money supply to stock returns and from industrial manufacturing to stock returns. The long-term causality ranges from inflation to return on stock and from exchange rate to return on stock. The research disclosed a short-and long-term connection that ranged from stock returns to industrial manufacturing. In the case of the United Kingdom, the results of the research disclosed a pattern in which short-term causality ranges from stock returns to T-bill, from stock returns to money supply, from stock returns to exchange rates, exchange rates to stock returns and stock returns to industrial manufacturing. The long-term causality also ranges from inflation to yields on stocks. The brief and long-term causal relationship shifts from stock returns to inflation, from supply of cash to stock returns and from industrial manufacturing to stock returns. The findings can be interpreted to mean that short-run interactions and long term causal relationship between both Germany and the UK stock markets and the macroeconomic fundamentals varied (Mahedi, 2012).

Lokeswar (2012) studied the impact of inflation and GDP on stock market returns in India using the regression analysis. He tested the impact of Real Gross Domestic Product (RGDP), Interest Rate (INT) and Inflation Rate (INF) on the stock prices, represented by Stock Market Value Index, of quoted companies for the period from 1997 to 2009. The analysis showed that the explanatory variables accounted for 95.6% of stock price variations. While a reduction in interest and inflation rate resulted in increased stock prices, increased RGDP has a positive impact on the stock prices.

2.2.4 Money Supply and Performance of Stock Market

Money is used in daily transactions for executing company activities towards the realization of set organizational objectives (Ihsan & Anjum, 2013). As the money supply increases it will reduce

interest rate this will fuel investment but if money supply reduces interest rate will increase and make investment difficult. Also increased money supply will put more disposable income in the hands of Kenyans so that they can spend on listed companies' products. This will make stock markets across the world prosper and able to buy labor, raw materials and capital expenditure. Stock market flourish as prices increase and firms issue more shares.

Muazu & Alhassan (2014) investigated the effect of macroeconomics variables on stock market returns in Ghana, for the 10-year period from September 2000 to September 2010, by employing the Johansen multivariate cointegration approach and vector error correction model (VECM), they presented evidence of long-run relationship between macroeconomic variables and stock returns. However, their Granger causality could not establish causality from any direction between macroeconomic variables and stock prices. Their results show that among the macroeconomic variables, shocks to inflation, money supply and exchange rate do not explain a significant proportion of the variance error of the stock returns but their effect persist over a long period.

A study by Husain and Mahmood (1999) on the relationship between monetary expansion and stock performance in Pakistan utilized dependent variables and stock indices of six sectors were used as independent variables. The study established a negative relationship between money efficiency and stock market performance. Further, the study revealed after an Augmented Dickey Fuller test that both money supply and stock market performance changed in the short run and long run changes depending on the stock market prices (Husain & Mahmood, 1999). The study revealed that change in money supply causes changes in stock prices in both short and long run and this implies that stock market is not efficient with respect to money supply changes (Husain & Mahmood, 1999).

2.3 Knowledge Gap

The aim of this research, the Nairobi Securities Exchange case, was to determine the impact of macroeconomic factors on stock market results in Kenya.

The impact on stock market performance of macroeconomic variables has been widely researched worldwide. From the developed stock markets to the developing or emerging stock markets, the studies have been showing different results. The literature available shows that some writers have developed a favorable relationship between different macroeconomic variables and performance on the stock market, while others have developed a negative or no connection with the same variables.

Studies conducted both internationally and locally made different conclusions. While a weak connection was developed by some writers, others discovered a powerful connection. Again, some writers had only long-run relationships, while others had long-run and short-run relationships. There is a clear discrepancy between the macroeconomic variables and the performance of the stock market. And this study seeks to fill that gap of non-conclusive results.

2.4 Conceptual Framework

The conceptual framework explicates graphically or in the form of a description of the main factors, concepts, variables studied and the relationships assumed between them. It is a research tool designed to help the researcher become aware and understand the situation under study.

The conceptual framework describes the relationship between specific variables identified in the study. The dependent variable is the stock market performance which was measured using NSE All share Index while the independent variables comprise Exchange rate, Inflation, Interest rate and Money Supply.

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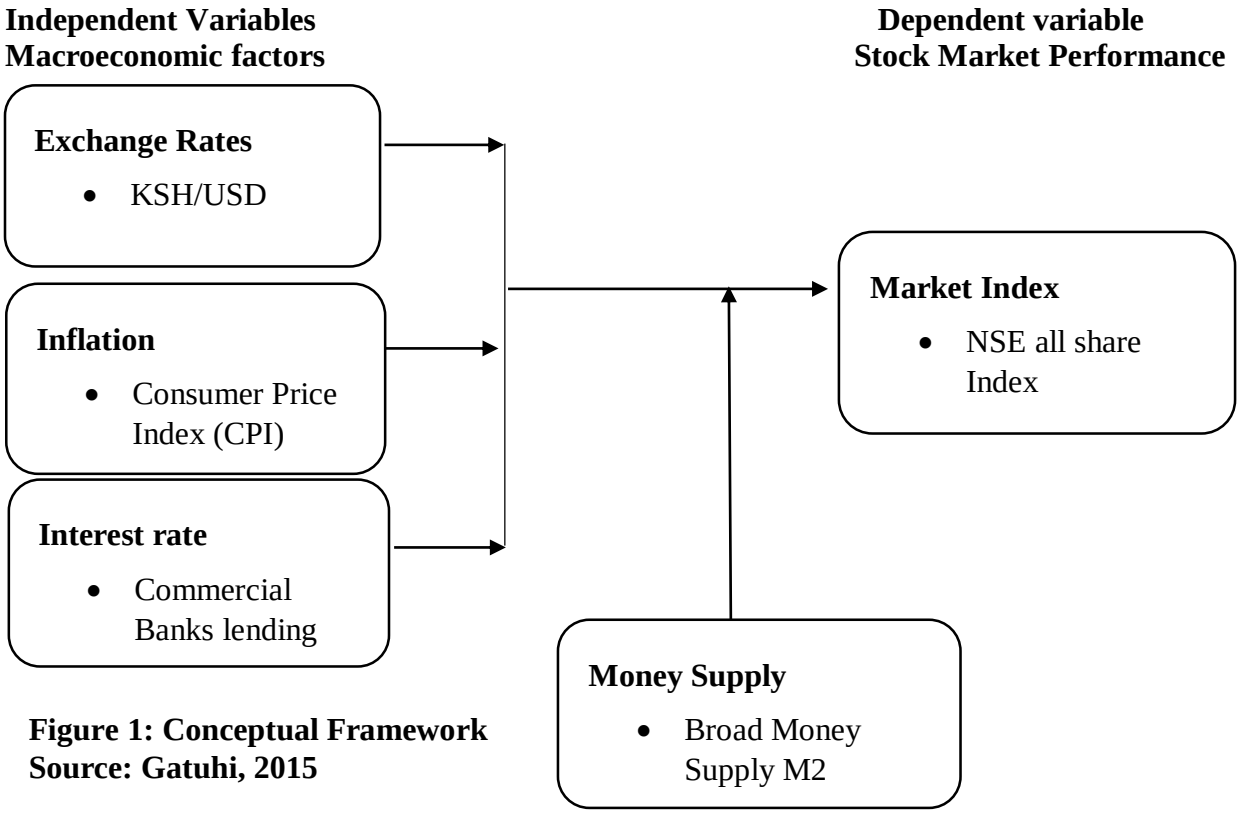

Figure 1: Conceptual Framework
Source: Gatuhi, 2015

3.0 Research Methodology

In order to answer the research questions, the study used a multivariate time series econometric design. This is because the research used monthly time series data from 2008 to 2017 to determine the connection over time between present and previous values. The research assessed the effect of four macroeconomic factors on the performance of the Kenyan stock market, since it is a time series study, the target population will be all the macroeconomic factors and the stock market performance in Kenya for a population period from 1963 to 2018. In this study, a sample of four macroeconomic factors was taken with a sample period of 10 years from 2008 to 2017 where the results were generalized. The secondary data were gathered from the Nairobi Securities Exchange, from the Central Bank of Kenya and from the Kenya National Bureau of Statistics spanning a period of ten years from 2008-2017.

Since the study aimed at effects of macroeconomic factors on stock market performance, the study employed series correlation and Vector Autoregressive Model. E-views were used to run the regression. In order to recognize the trends revealed in the information gathered for the chosen variables, the data analysis was driven by the aims and objectives of the research and data collection measurement. The collected data were sorted and integrated into E-views to produce graphs, tables, descriptive statistics and survey statistics. Analysis of regression was used to assess the importance of the dependent variable and independent variables. Regression analysis was

performed using the VAR model to estimate and provide empirical evidence on the nature of the relationship between the macroeconomic factors and the stock market performance. Before running the regression equation, diagnostic and specification tests were performed as follow. These diagnostics included normality, multicollinearity, heteroscedasticity, autocorrelation and Hausman tests.

For the purpose of this study, the unit of analysis was Nairobi Securities Exchange all share Index that was obtained from NSE. Other variables were selected macroeconomic variables which included; Exchange rates, Interest rate, Inflation and Money Supply.

Equation (i) indicates the model of regression of the independent variables in the OLS model against the dependent variable ;

$Y\text{t} = \beta 0 + \beta 1X1\text{t} + \beta 2X2\text{t} + \beta 3\text{X3t} + \beta 4X4\text{t} + \varepsilon$ ……. Equation (i)

Where:

Yt – Stock Market Performance, measured by NSE all-share price, at time t.

β_0 - constant

$\beta 1$, $\beta 2$, $\beta 3$ and $\beta 4$ - Regression coefficients for the various independent variables.

X1- Exchange rate.

X¬2- Interest rate.

X3- Inflation

X4- Money Supply

ε – is the error term

It was assumed that the stock market performance could be estimated by the combined effects of the four explanatory variables of: Exchange rate (X1), Interest rate (X¬2), Inflation(X3) and Money Supply (X4) plus an error term. The model was theoretically expected to be linear since no independent variable term would have a degree higher than unity. After running the Breusch-Godfrey serial correlation test, the results showed that there was a problem of serial correlation, therefore we opted for the Vector Autoregressive (VAR) Model to run the regression. VAR models have been used primarily for macroeconomics models, they offer an interesting alternative to either structural econometric (market share) or univariate models for problem in which simultaneous forecasts are required for a collection of related macroeconomic variables. The use of VAR models for economic forecasting was proposed by Sims (1980).

4.0 Results and Findings

4.1 Diagnostic and Specification Tests

4.1.1 Descriptive Statistics

This part gives a description of variables that were used to describe how the macroeconomic variables are related to the performance of the stock market in Kenya. The results are given in tables and charts. Table 1 gives the summary statistics of the variables that have been included in the model. They are as follows, minimum, maximum, mean, standard deviation, skewness, kurtosis and Jarque-Bera test for normality.

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Table 1: Group Descriptive Statistics

	NASI	C	ER	IR	MS	CPI
Mean	110.8526	1.000000	87.62497	15.80992	1545566.	135.6777
Median	97.04567	1.000000	86.29350	15.03500	1468700.	134.9356
Maximum	172.9277	1.000000	105.2750	20.34000	2538195.	187.6351
Minimum	58.41550	1.000000	61.89900	13.61000	682257.1	86.07322
Std. Dev.	36.38614	0.000000	10.93514	2.000485	598866.7	29.09470
Skewness	0.337689	NA	-0.084819	0.729393	0.166005	0.062369
Kurtosis	1.550873	NA	2.336649	2.434732	1.639477	1.822321
Jarque-Bera	12.78052	NA	2.344060	12.23792	9.806261	7.012434
Probability	0.001678	NA	0.309738	0.002201	0.007423	0.030010
Sum	13302.31	120.0000	10515.00	1897.190	1.85E+08	16281.32
Sum Sq. Dev.	157550.2	0.000000	14229.69	476.2309	4.27E+13	100733.7
Observations	120	120	120	120	120	120

The Jarque-Bera Test tests the null hypothesis of normality against the alternate of non-normality. From the Table 4.1 the p-values for NASI, Interest Rates, Money Supply and Consumer Price Index are less than 0.05 (5% relevance level) indicating that the Jarque-Bera values are important at 5% meaning and therefore we dismiss the null hypothesis and conclude that not all the variables under research are usually distributed. By extension, the skewness of Exchange Rates indicates that its negatively, while NASI, Interest Rates, Money Supply and Consumer Price Index are positively skewed with normal kurtosis values.

4.1.2 Hausman Test

Table 2 presents the Hausman test also described as a test for model specification helps to choose between fixed effects model or random effects model.

Table 2: Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section and period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	3.123576	4	0.5374

The Hausman test is used to differentiate between fixed effect model and random effect model, it tests the null hypothesis of applying random effects. From the Table 2 the probability value is more than 0.05, we thus accept the null hypothesis, meaning that the random effects model is preferred due to that high efficiency.

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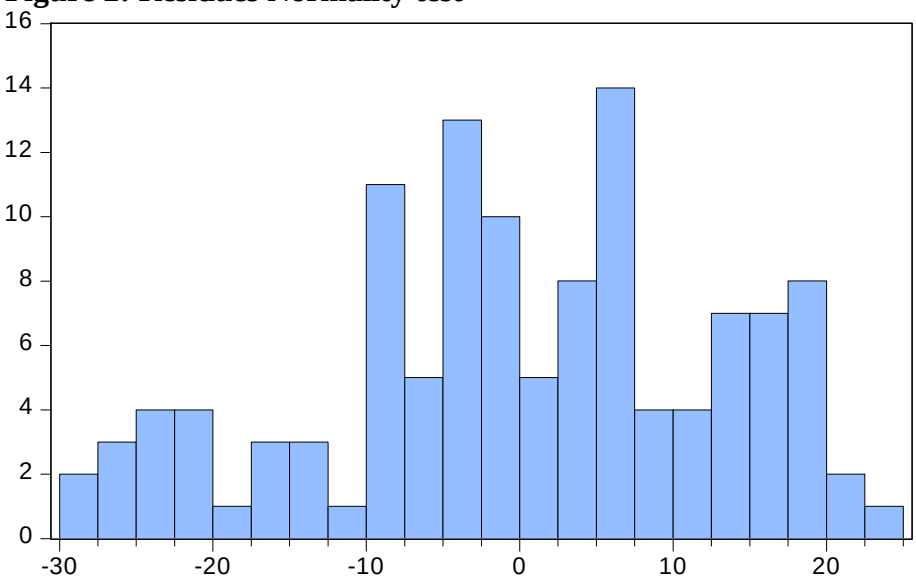
4.1.3 Normality Test

Figure 2: Residues Normality test



Series: Residuals
Sample 2008M01 2017M12
Observations 120

Mean	4.55e-14
Median	-0.159345
Maximum	22.66472
Minimum	-28.00566
Std. Dev.	12.95520
Skewness	-0.339867
Kurtosis	2.413828
Jarque-Bera	4.028179
Probability	0.133442

The Normality Test of the residues from a random effects model was run on E-views for all the variables. Based on Figure 2, the probability value is higher than 0.05, we hence conclude that residuals were normally distributed. Furthermore, the skewness less than zero and kurtosis value was less than three and Jarque–Bera value was not significantly Large. Thus, the disturbance term is almost the same as being normal.

4.1.4 Stationarity Tests

Tests for stationarity were conducted using Unit root test suggested by the Augmented Dickey Fuller (ADF) in e-views software The ADF tests a unit root's null hypothesis (i.e. the information is not stationary) against the no unit root (stationary) option.

Table 4.3: NASI Unit Root Test

NASI

At Level

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-0.450979	0.8955	Non-stationary

First Difference

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-10.21283	0.0000	Stationary

From the table 3, At level the ADF Test of -0.450979 has a probability of 0.8955 which means that the data are not stationary. But at first difference, the Augmented Dickey- Fuller Test of –10.21283 has a p-value of 0. 0000. Meaning that Augmented Dickey Fuller Test value is significantly lower than 0.05 significant level (*p* less 0.05) thus we reject null hypothesis of a unit root in NASI and conclude that the series are stationary at first difference.

Table 4: CPI Unit Root Test

CPI

At Level

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-0.438333	0.8978	Non-stationary

First Difference

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-6.260659	0.0000	Stationary

From the Table 4 the series are not stationary at level but at first difference the Augmented Dickey Fuller Test of -6.260659 has a p- value of 0.0000. We therefore reject the hypothesis of a unit root in Consumer Price Index data and conclude the Time series data is stationary at first difference it became significant since the probability value is lower than 0.05.

Table 5: Exchange Rates Unit Root Test

ER

At Level

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-1.301822	0.6271	Non-stationary

First Difference

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-7.704197	0.0000	Stationary

Table 5 shows that the series are not stationary at level, but at first difference the Augmented Dickey Fuller Test of -7.704197 has a p-value of 0.0000 ($p<0.05$). We reject the null hypothesis of a unit root in Exchange Rates data in favor of the alternative that the time series data is stationary at first difference.

Table 6: Interest Rates Unit Root Test
Interest Rates
At Level

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-1.904359	0.3294	Non-stationary

First Difference

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-8.839008	0.0000	Stationary

From Table 6 above, the series are non-stationary at level and when tested at first difference, the Augmented Dickey Fuller Test of -8.839008 has a p value of 0.0000. We reject the null and accept the alternate that the series are stationary at first difference.

Table 7: MS Unit Root Test
MS

At Level

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-2.058615	0.2619	Non-stationary

First Difference

	t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic	-13.73602	0.0000	Stationary

Table 7 shows that the series are not stationary at level, but at first difference the Augmented Dickey Fuller Test of -13.73602 has a p value 0.0000. We thus reject the null hypothesis and accept the alternate of a unit root in Money Supply series and conclude that the series are stationary at first difference.

4.1.5 Multicollinearity Test

Table 8: Multicollinearity test

Variance Inflation Factors
Sample: 2008M01 2017M12
Included observations: 119

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	1.011217	2.480900	NA
D(ER)	0.143220	1.113187	1.082767
D(IR)	1.363451	1.094196	1.094191
D(CPI)	0.459847	1.768768	1.019465
D(MS)	1.40E-09	1.850892	1.016372

From the above centered VIFs, it is clear that multicollinearity problem does not exist in the model since the VIF values of all the variables under study do not exceed 10.

4.1.6 Panel Cointegration Test

Table 9: Panel Cointegration Test

Pedroni Residual Cointegration Test
Series: NASI ER IR MS CPI
Null Hypothesis: No Cointegration
Trend assumption: No deterministic trend

Alternative hypothesis: common AR coefs (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel ADF-Statistic	-3.74569	0.00256	-3.618790	0.0004

The ADF tests the null of a unit root in the panel against an alternate of no unit root in the process. Hence, from the table 9 the p value of 0.0004 is less the critical value of 0.05 at 5% significance level. We hence reject the null of no Cointegration and no deterministic trend assumption in favor of Cointegration and a deterministic trend in the panels.

4.1.7 Heteroskedasticity Test

Table 10: Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.265792	Prob. F(4,114)	0.8994

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From the above table, the probability value is more than the significance level of 0.05, We therefore do not reject the null hypothesis of homoscedasticity and conclude that the model does not suffer from the problem of Heteroscedasticity.

4.1.8 Serial correlation test

The serial correlation test was based on residual OLS estimation. The Breusch-Godfrey Serial Correlation LM Test tests the nullity of non-correlation in the string with an alternative to the correlation.

Table 4.11: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	133.4579	Prob. F(2,113)	0.0000

From the table 11 above, the Breusch-Godfrey F-statistic of 133.4579 has a probability of 0.0000 which is less than the significance levels, therefore, we end up rejecting the null hypothesis of no-correlation and conclude that the residues have serial correlation. If the problem of serial correlation occurs, the data is either treated or use a different model all together.

4.2 Unrestricted VAR model Output

The Unrestricted Autoregressive Vector Model requires the amount of lags specified. To determine the number of lags it is necessary to run a VAR of residuals at each lag level to determine the lag at which the residuals have no serial correlation.

Table 12: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: NASI
Exogenous variables: C ER IR CPI MS
Sample: 2008M01 2017M12
Included observations: 112

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-446.8550	NA	186.9837	8.068839	8.190201	8.118079
1	-366.2766	152.5233*	45.15146*	6.647797*	6.793431*	6.706885*
2	-366.1246	0.285100	45.84311	6.662939	6.832845	6.731875
3	-365.9201	0.379671	46.50278	6.677145	6.871324	6.755930
4	-365.8934	0.049108	47.32298	6.694526	6.912977	6.783158
5	-365.8583	0.064077	48.15160	6.711755	6.954478	6.810235
6	-365.8011	0.103107	48.97692	6.728591	6.995586	6.836919
7	-365.3748	0.761270	49.49066	6.738835	7.030103	6.857012
8	-365.2903	0.149351	50.31775	6.755184	7.070724	6.883209

* indicates lag order selected by the criterion

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Form the table 12 the number of lags that were selected by the criterion is 1. Therefore, the unrestricted VAR was run using 1 lag.

Table 13: Unrestricted VAR model Output

Vector Autoregression Estimates
Sample (adjusted): 2008M02 2017M12
Included observations: 119 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	NASI
C	304.3326 (21.0213) [14.4773]
ER(-1)	-2.171893 (0.27779) [-7.81847]
IR(-1)	-4.322553 (0.64594) [-6.69191]
CPI(-1)	-1.180021 (0.31139) [-3.78951]
MS(-1)	0.000146 (1.4E-05) [10.3358]
R-squared	0.883646
Adj. R-squared	0.879564

At 5% Significance level and 4 degrees of freedom, the critical value of the t-statistic is ± 2.78 (Appendix II).

4.2.1 Effect of Exchange Rates on NASI as A Determinant of Share Price Index on Stock Market performance

H0 Exchange Rates does not affect the Share Price Index listed in the NSE. The study's first aim was to evaluate the impact of the exchange rates on NSE's share price. From the above table, the Exchange rate given a lag of one month, is found to have a long run and significant impact on NASI seen that the t-value of -7.81847 whose absolute value is greater than the critical value of 2.78The research discovered that the lagged exchange rate had a long-term negative impact on the performance of the stock market. It can be well noted from the table that a unit increase in exchange rates would lead to a decrease in NASI by factor -2.171893 then we reject the null hypothesis and accept the alternate.

4.2.2 Effect of Interest Rates on NASI as A Determinant of Share Price Index on Stock Market performance

H_0 Interest Rates does not affect the share price listed in the NSE. The second aim of this research was to evaluate the impact of interest rates on NSE-listed share price. From the above table, the t-statistic of -6.69191 whose absolute value is greater than the critical value of 2.78, this means that the interest rate has a long-term effect on the performance of the stock market.. The findings show also that lagged Interest rate had a negative effect on the stock market performance, an increase in one unit of the Interest rate would lead to a decrease in NASI by factor -4.322553 hence we end up rejecting the null hypothesis.

4.2.3 Effect of Inflation On NASI as A Determinant of Share Price Index on Stock Market performance

H_0 Inflation does not affect the share price listed in the NSE. The third objective of this study sought to explore the extreme end to which the inflation proxied by CPI affects share price listed on NSE.

The VAR results show that the CPI given a lag of one month has a t-statistic of -3.78951 whose absolute value is higher than the critical value, meaning that Inflation had a long-run and significant effect on the stock market performance. An increase of one unit in the CPI would lead to a decrease of the NASI by factor -1.180021, showing a negative relationship between Inflation and Stock market performance. The null hypothesis is therefore rejected in favor of the alternative

4.2.4 Effect of Money Supply on NASI as A Determinant of Stock Market Performance

H_0 Money Supply does not affect the share price listed in the NSE. The fourth objective of this study explored on the extent to which Money Supply, represented by M2, affects share price determination on NSE. The results gave a positive relationship between the money supply and the share price. For instance, an increase in one unit of the money supply would lead to an increase in share price by factor 0.00146. Also, from the findings, the t test statistic of 10.3358 shows a long-run and significant effect of Money Supply on share price index listed in NSE. Therefore, we reject the null hypothesis and accept the alternate.

4.2.5 Testing The Strength of the Model

The Adjusted R –Squared shows the variation of percentage elaborated by the independent variables, which eventually affect the dependent variable. The model had an adjusted R squared 0.879564, this shows that 87.95 % of variations in determinants of share price index listed in NSE can be expounded by the variations of the independent variables under study. And the remaining variation can be further developed by other factors. The adjusted R squared value of 87.95% displays that the model had a good projecting power in using the independent variables to illustrate share price index listed in NSE which is the dependent variable under this study.

4.2.6 Testing The Validity of the model

Hypothesis was used as follows:

H_0 The model is statistically significant

H_1 The model is not statistically significant

The model that was supposed to be used is the Ordinary Least Squares (OLS), but after performing the Breusch-Godfrey serial correlation LM test, the results showed that there was a problem of serial correlation whose solution is either to treat the data or to use a different model that why we

ended up using the Vector Autoregressive (VAR). An adjusted R-squared of 87.95% clarified that the VAR was a good data fit.

4.2.7 Linking of Findings and The Literature Review

The VAR results from this study indicated that the Exchange rate, Interest rates and Inflation have a negative and significant effects on the performance of the stock market represented by the NASI, while Money Supply have a positive and significant relationship with the share price of the Nairobi Securities Exchange. These conclusions agree with various studies done under the Macroeconomic variables' effect on the stock exchange. For instance, (Maku & Atanda, 2010) Used the Augmented Dickey-Fuller unit root test to examine the properties of the time series variables. The Augmented Engle-Granger Cointegration test result revealed that the stock market performance in Nigeria is mainly determined by macroeconomic forces in the long run. However, the empirical analysis had showed that the NSE all share Index is more responsive to changes in exchange rate, inflation rate, money supply and real output. Adjasi used the Exponential Generalized Autoregressive Conditional Heteroscedasticity to determine the relationship between Exchange rate fluctuations and the stock market volatility and found a negative relationship between the Exchange rate and the stock market performance and argued that the devaluation of the local currency would lead to an increase of the performance of the stock market over the long term while it reduces the performance of the stock market in short term. Similarly, Omandi and Olweny (2011) used time series methodology on the data from 2001 to 2010 to study the impact of macroeconomic components at NSE on the stock returns with the foreign exchange as one of the independent variables and their results showed a negative relationship between the foreign exchange and the stock return. At the same time, it contradicts the findings of Nancy (2017) who investigated the effect of real exchange rate on the Nairobi Securities Exchange and found that real exchange rate was significant and positively correlated with the NSE Index.

Interest rate and stock market performance are also negatively correlated; This is also verified by the outcomes of the research conducted by Uddin and Alam (2007) assessing the linear connection between share prices and interest rates, share prices and interest rate changes, shifts in share prices and interest rates and shifts in share prices and interest rate changes on the Dhaka Stock Exchange (DSE). And discovered an important negative connection between the interest rate and the share price. And in 2008, Ahmed used Johansen's (1990) approach; the causality test of Toda and Yamamoto (1995), FEVD analysis, and IRFs analysis to test the long and short run influence of the Indian stock prices on a group of macroeconomic variables and established a negative correlation between interest rate and stock prices. And also, Rasiah and Ratneswary (2010), Lokeswar (2012) and Njau (2013) among others, concluded that Interest rate has a negative relationship with the Stock market performance.

The study also established that lagged Inflation rate had a negative long run effect on the stock market performance, these results are supported by Njau (2013) whose results revealed that Inflation and Interest rate have a big impact on the firm performance, as well as Spyrou (2001) who found a negative correlation between inflation and the performance of the Greek stock market. Also, Mohammed (2011) and Lokeswar (2012) established a negative relationship between Inflation and stock market performance. On the other hand, the results are contrary to those of Ochieng and Adhiabo (2012) and Ratanabukarn and Sharma (2007).

Money Supply in our study revealed a positive relationship between money supply and stock market performance which was in line with, Homa & Jaffe (1971), Hamburger & Kochin (1971) who found a positive relationship between money supply and stock prices. This result follows the ideas of real activity economists who argue that if there is an increase in money supply; it means that money demand is increasing which is a signal of an increase in economic activity. This increase in economic activity implies higher cash flows, which causes stock prices to rise (Sellin, 2001). But this contradicted the results of Ouma & Muriu (2014), Ochieng& Oriwo (2012).

5.0 Conclusion

This study surveyed the effect of Exchange rates, Interest Rates, Inflation Rates and Money Supply on stock market performance listed in NSE. The results revealed that all the independent variables that were studied explain 87.95% of variations in stock market performance as represented by adjusted R2. Based on this findings, we can conclude that stock market performance in Kenya listed in NSE is efficient enough in determining how NSE performs. Subsequently, a further research with more than four macroeconomic variables and with a longer time scope would provide more faultless results. Making it a viable area of further research for the new upcoming Investors in this sector.

5.1 Recommendations

Based on the results, emphasis on optimal stock market performance should be emphasized since three of the four variables revealed to have a negative relationship with regards to the enactment on the macroeconomic factors affecting stock market performance by NSE while the remaining one showed a negative relationship. We then recommend that the Kenyan regulators should continue trying to find all possible means to adjust levels of the concerned macroeconomic variables (Exchange rates, Interest rates, Inflation and Money supply) in order to improve the performance of the Kenyan Stock Market. The study recommends also investors to always consider the trend of the macroeconomic factors, as it has already proved that they have a great impact on the performance of the stock before making their investment decisions. This helps to boost confidence of all the investors in Kenya to have interests in the best performing stock markets as they asses the macro economic factors enabling them to do well.

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