

**MACROECONOMIC VARIABLES AND STOCK MARKET PERFORMANCE A CASE  
OF NAIROBI SECURITIES EXCHANGE**

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## DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

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## **DEDICATION**

Special dedication goes to my Family My Dad Haji Migdad Saad, My husband Salim Faris, My children Jaasim, Ayman, Muhammad and Saada and my employer Umma University for the support, patience, understanding & encouragement during the long working hours while pursuing this study. To my late mum am so very much indebted to you and am proud of how you raised me.

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## ABSTRACT

Nairobi Stock exchange (NSE) is playing a vital role in the growth of Kenya's economy by encouraging savings and investment, as well as helping local and international companies' access cost-effective capital. NSE operates under the jurisdiction of the Capital Markets Authority of Kenya. Presently, NSE's market capitalization closed at Sh1.976 trillion compared to the Sh1.986 trillion value in December 2022, representing a 0.49 per cent depreciation. The purpose of this study was to examine the effects of macroeconomic variables on stock market performance a case of Nairobi securities exchange. The study was guided by the following specific objectives; to find out the effect of changes in exchange rates on stock market performance at the NSE; to examine the effect of inflation rates on stock market performance at the NSE; to establish the effect of economic growth rate on stock market performance at the NSE; to determine the effect of changes in interest rates on stock market performance at the NSE and to establish the moderating effect of savings on the relationship between the macroeconomic variables and stock market performance. To conduct the study, the researcher adopted a correlational research design and relied on secondary data collected from the annual reports of the Kenya National Bureau of Statistics, Nairobi Securities Exchange, and Central Bank of Kenya for the period 2000-2021. The collected data was analyzed using Pearson correlation analysis and time series multiple regression analysis. E-Views version 9.0 software was utilized for the analysis. The Pearson correlation matrix was used to assess the strength of the relationship between stock market performance and macroeconomic variables. Additionally, a time series data model (ARDL-ECM) was employed to determine both short-term and long-term effects of macroeconomic variables on the NSE's stock market performance. The study also examined the moderating effect of gross domestic savings through Baron and Kenney stepwise regression. Furthermore, classical linear regression and ARDL bound tests were performed to establish the existence of a long-term co-integration relationship between macroeconomic variables and stock market performance. The study results finding show that the R-squared value of 0.948827 suggests that the independent variables explain about 94.9% of the variation in market capitalization, which is a strong fit. The adjusted R-squared value of 0.861103 is lower than the R-squared value, suggesting that some of the independent variables may not be adding significant explanatory power to the model. The findings of the study indicate that interest rates, inflation rates, and economic growth rate have significant effects on stock market performance, as represented by market capitalization, in the long run. However, no statistically significant impact was found for exchange rates. On the moderating variable Gross domestic savings was found not to be a significant predictor of stock market performance on the NSE in Kenya. These findings highlight the crucial role played by macroeconomic factors in shaping the NSE's stock market performance. In conclusion, the study suggests that interest rates, inflation rates, and economic growth rate are important determinants of stock market performance at the NSE. Policymakers are advised to consider the interplay between macroeconomic variables and stock market performance, and implement appropriate policies and measures to manage exchange rates, inflation rates, economic growth, and interest rates. This will create a stable and supportive environment for the NSE and foster sustainable stock market growth. The study also suggests that future research could explore the effects of other macroeconomic variables on stock market performance.

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## LIST OF ACRONYMS

<b>NSE</b>	Nairobi Securities Exchange
<b>GDP</b>	Gross Domestic Product
<b>CBK</b>	Central Bank of Kenya
<b>KNBS</b>	Kenya National Bureau of statistics
<b>CAP</b>	Market Capitalization
<b>APT</b>	Arbitrage Pricing Theory
<b>CAPM</b>	Capital Asset Pricing Model
<b>EMH</b>	Efficient Market Hypothesis
<b>TGARCH</b>	Threshold Generalized Autoregressive Conditional Heteroscedasticity model
<b>CUSUM</b>	Cumulative Sum of Recursive Residuals
<b>ARDL</b>	Autoregressive distributed Lag

## OPERATIONAL DEFINITION OF TERMS

**Interest Rate** :- represent the cost of borrowing money, usually expressed as a percentage of the principal loan amount. They indicate the rate at which financial institutions lend money to borrowers

**Exchange rate** :- represents the rate at which one currency can be exchanged for another.

**Economic growth rate** :- measures the increase in the value of goods and services produced by an economy over a specific period, typically represented as a percentage change in the Gross Domestic Product (GDP)

**Inflation Rate** -: This is the rate at which the general level of prices for goods and services increases, resulting in a decrease in purchasing power

**Stock market Performance**:-it reflects the overall health and anticipated future performance of the economy. A rising stock market generally indicates a robust economy and investor confidence, while a declining stock market suggests a weak economy and a lack of investor confidence

**Savings** :- refers to the portion of disposable income that individuals do not spend on consumption but set aside for future use. In macroeconomics, savings is considered a key variable that influences economic growth and stability

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background of the study**

Stock market is a financial market where publicly traded companies' stocks are bought and sold. It is a place where investors can buy and sell securities, such as stocks, bonds, and other securities(Alshubiri, 2021). The stock market plays a crucial role in the economy, as it allows companies to raise capital by selling shares of stock to investors, and it allows investors to buy and sell those shares(Heijdra et al., 2019). It is often seen as a barometer of a country's economic health, as the performance of the stock market can be influenced by a variety of factors, including the overall health of the economy, the performance of individual companies, and market sentiment(Bustos & Pomares-Quimbaya, 2020)

Stock markets are components of a free-market economy which allows companies to raise money by offering stock shares and corporate bonds.(Farias Nazário et al., 2017). Stock markets ensures price transparency, liquidity, price discovery, and fair dealings in trading activities(Bhuiyan & Chowdhury, 2020). This is achieved through an enabling environment for all interested market participants to access data for all buy/sell orders, thereby helping in the fair and transparent pricing of securities(Heijdra et al., 2019).

##### **1.1.1 Stock Market Performance on Global Perspective**

The united states saw the birth of its stock market in 1790 with the significant of the Buttonwood Agreement in Philadelphia, which eventually led to the establishment of wall street in New York in 1792 (Xu et al., 2019). The market experienced exceptional gains in the early 2000s, with the S&P 500 index achieving significant growth and becoming triple its value since 1995(Heckman, 2017). However, 2022 proved to be a challenging year for the US

equity market, marked by a stock market selloff triggered by the Federal Reserve's effort to combat inflation through aggressive rate hike (Minnis, 2022; Procasky & Yin, 2023).

In the United Kingdom, the London stock exchange traces its origin back in 1773 when traders would meet in coffeehouses to exchange shares (Apergis & Voliotis, 2015). London is considered one of the major financial hubs globally, along with New York city and Tokyo. The UK ranks third in terms of global equity market share, behind us and Japan (Procasky & Yin, 2023). The country also hosts the world's largest foreign exchange market and is a prominent center for off-exchange derivatives (Apergis & Voliotis, 2015). As of November 2022, the London stock exchange had nearly 1963 listed companies within a combined market capitalization of approximately 3.58 trillion British pounds (Wang et al., 2023).

Germany's stock market history dates back to 1585 when commercial merchants agreed on standardized rates of exchange (Celebi & Hönig, 2019). The Frankfurt stock exchange, facilitated by the Xetra trading platform, has become one of the world's largest electronic cash market exchanges. Germany's strong economy, characterized by low unemployment and steady growth has had a positive impact on investment confidence and stock market performance (Gaio et al., 2022). . Despite the challenges posed by the COVID-19 pandemic, the German stock market has shown signs of recovery, with the total market capitalization of listed companies surpassing pre-pandemic levels by the end of 2021, reaching 2.21 trillion euros (Ozkan, 2021).

### **1.1.2 Performance of stock markets in Africa**

Africa's stock exchanges have diverse history and varying degrees of development. In Morocco, the Casablanca Stock Exchange, founded in 1929 (Lahmiri & Bekiros, 2020), is currently the third-largest exchange on the continent, while the Johannesburg Stock Exchange (JSE) in South Africa holds the top position (Baranidharan & Alex, 2020). The JSE established

in 1887, is the largest exchange in south Africa and is considered then leading exchange in Africa. South Africa boasts a robust and productive economy, market making it an attractive option for investors (Ndako, 2012). The JSE experienced a market crash in 2020 but showed a strong recovery, reaching new all-time high by February 2021 (Udejaja & Isah, 2022).

The Moroccan stock market represented by the MASI index, tracks the performance of listed companies on the Casablanca Stock Exchange (Ndako, 2012). In 2015, the market experienced modest growth and inflation rates in Morocco reached record highs in 2022 (Louziri & Oubal, 2022).. In Namibia, the Namibian Stock Exchange (NSX) is the only stock exchange in the country and is the second-largest exchange in Africa based on market capitalization. The NSX has benefited from improvements in governance and has attracted international investors (Takyi & Bentum-Ennin, 2021).

Despite the expansion of stock exchanges in Africa, they still face challenges (Ibrahiem & Hanafy, 2021). Many African exchanges, excluding south Africa, are considered small in size, with limited listings, low capitalization, and low liquidity (Kumo, 2011). Banks continue to dominate the the4 financial systems in many sub- Saharan countries. However, stock exchange plays a crucial rtrole in economic development by mobilizing long-term funds, providing investment opportunities, attracting foreign capital, and serving indicators of economic performance (Baranidharan & Alex, 2020).

### **1.1.3 Performance of stock market in Kenya**

The NSE in Kenya has a long history, starting in the early 1920s when Kenya was still a British colony. It began as an informal marketplace for local shares and stocks and gained recognition as an overseas stock exchange by the London stock exchange in 1954 (Mathuva, 2016; Manivannan Babu et al., 2022; Isaac, 2022). After Kenya gained independence, the NSE continued to grow and became a major financial institution. The stock market in Kenya

experienced significant improvements in 1995 following its liberalization, leading to increased openness, market capitalization, and shares turnover (Onsongo et al., 2020).

Over the years, there have been fluctuations in the performance of the stock market, with periods of growth and decline. Currently, the NSE has faced challenges (NSE, 2018), with net selling by foreign investors causing a depreciation in market capitalization. Various studies have been conducted on the impact of macroeconomic variables on stock market returns in Kenya, but there is no consensus on their influence (NSE, 2018; Kori, 2018). In light of the COVID-19 pandemic that affected the global economy, many researchers have been examining the relationship between macroeconomic variables and stock market performance (Biswas et al., 2023).

#### **1.1.4 The Nairobi Securities Exchange**

NSE has seen tremendous development in structure, depth, breadth and regulation to be the third biggest exchange in Africa by 2014 in terms of volume, behind Johannesburg and Nigerian stock exchanges ( Kori, 2018). Despite its recent growth, the NSE is still considered as of the emerging markets of the world, characterized by low trading volume, few listed companies, low turnover ratios, and inefficient information delivery(Kimani et al., 2021). The performance of the NSE largely reflects the economic, policy, institutional and political environment at the time(Isaac, 2022).

The Nairobi Securities Exchange or NSE houses both local and international investors looking to gain exposure to Kenya and Africa's economic growth. The NSE demutualized and self-listed in 2014 which meant that shares of the NSE can be tradeable on the stock exchange itself. This made it possible to separate ownership from management of the NSE while keeping along with the global trends (NSE, 2018;Muyundo et al., 2020). The NSE currently has four indices used to measure the performance of stocks. One of the indices is known as

the NSE All Share Index or NASI which is a weighted index of all the listed companies on the exchange(Kimani et al., 2021).

The Exchange also houses the Financial Times Stock Exchange also known as FTSE NSE Kenya 15 representing the performance of the largest 15 stocks trading on the NSE which is ranked by full market capitalization. It also has an index representing the performance of the 25 most liquid stocks trading on the NSE which is known as FTSE NSE Kenya 25(Hopper et al., 2017). The NSE 20 Share Index is a weighted index of 20 blue chip companies using market capitalization, shares traded, number of deals and turnover as criteria to be part of the 20 companies (Mutua & Atheru, 2017; Onsongo et al., 2020

### **1.1.5 Macroeconomic Variables**

Macroeconomic variables are key indicators that reflect the state of an economy.(de Pontes & Rêgo, 2022). In this study four variables are examined, firstly, exchange rates, which represent the value of one's country's currency compared to another. Exchange rates can have significance effect on the economy. Secondly, inflation, which measures the rate at which the prices for services are increasing thus affecting the purchasing power(Zeng et al., 2022). Thirdly, the economic growth rate, which refers to the expansion of a country's production over time, often measured by GDP or GNP, lastly, interest Rates, determined by the central banks, influences the cost of borrowing and return on investments. Higher interest rates can slow down economic growth, while lower rates can stimulate borrowing and accelerate economic activity (Biswas et al., 2023).

### **1.2 Statement of the problem**

Tough times loom for the bearish Nairobi Securities Exchange (NSE) as a cocktail of global and domestic factors collude to push the benchmark index below the 1,700 mark for the first time in 20 years, signaling muted activity and free fall of stock prices on the 68-year-old stock

market(Okumu et al., 2021). The falling turnover on the NSE and the drop by the NSE-20 Share index to a low of 1,681.8 , is largely a result of massive sell-off by foreign investors who are fleeing frontier and emerging markets in search of safer havens following a rise in interest rate in the US and news that Sri Lanka has defaulted on its debt obligations for the first time in its history-East African(Onsongo et al., 2020).The Nairobi Securities Exchange (NSE) has shed about Sh10 billion in its trading at the beginning of 2023, continuing the woes of massive net selling by foreign investors that gripped the bourse for months in the previous year 2022. Presently, NSE's market capitalization closed at Sh1.976 trillion compared to the Sh1.986 trillion value it had in December 2022, representing a 0.49 per cent depreciation(Isaac, 2022).

The problem of stock market performance falling day by day at the NSE will make the achievement of Kenya's Vision 2030 Impossible(Okumu et al., 2021). Despite the fact the country has laid down macroeconomic frameworks that aim at regulating the monetary policies in order to create an enabling environment to achieving the country's Vision, Inflation climbed to 6.1% in 2021 from 5.3% in 2020, reflecting increased input costs. It is evident that the preferred rates of Inflation at 5% or below and GDP growth rate Accelerating at 10% annually are yet to be attained that will subsequently contribute to positive stock market performance in Kenya thus achieving the country's set vision 2030(Yaakub et al., 2018).

The effects of macroeconomic variables on stock performance have been studied in different economies. Several studies conducted in the US (Salisu et.al 2019; Fama 2019, Liu, 2020; Al-Jafari et al., 2011) describe the correlation between US stock return and the aggregate real economic activity. These studies reveal the significance of domestic macroeconomic variables such as inflation, money supply, currency rate, resources, interest rate, and industrial production as sources of stock market changes. However, majority of the existing studies have

entirely focused on the developed countries and other emerging markets. There is therefore need for an empirical review of the impact of the macroeconomic variables on stock market performances in Africa.

Consequently, while the relationship between stock market returns and macroeconomic variables have been amply examined, there is a gap in the literature when it comes to the relationship between macroeconomic variables and stock market performance at the NSE. Studies by Songole (2013) on The Relationship between Selected Macroeconomic Variables and Stock Return at the Nairobi Securities Exchange and Kori (2018) on macroeconomic variables and their effect on stock market returns in Kenya showed varied results on the macroeconomic factors that have an impact on stock market returns. It was also clear that there is a lack of consensus on the effect macroeconomic factors have on stock market returns. The aim of this study was therefore to understand the effects of macroeconomic variables on stock market performance in Kenya with the focus on the Nairobi Securities Exchange over the period 2000-2021.

### **1.3 The objective of the study**

The general objectives of the study will be to determine the effect of macroeconomic variables on stock market performance. A case of the Nairobi Securities Exchange. The specific objectives will be: -

- (i) To find out the effect of changes in exchange rates on stock market performance at the NSE.
- (ii) To examine the effect of inflation rates on stock market performance at the NSE
- (iii) To establish the effect of economic growth rate on stock market performance at the NSE.

- (iv) To determine the effect of changes in interest rates on stock market performance at the NSE.
- (v) To determine the effects of saving as a moderating variable between macroeconomic variables and stock market performance.

#### **1.4 Research Hypotheses**

The following null hypotheses guided this study:

**H<sub>01</sub>:** There is no statistically significant effect of changes in exchange rates on stock market performance at the NSE.

**H<sub>02</sub>:** There is no statistically significant effect of inflation rate on stock market performance at the NSE.

**H<sub>03</sub>:** Economic growth rate does not statistically significantly affect stock market performance at the NSE.

**H<sub>04</sub>:** There is no statistically significant effect of interest rates on stock market performance at the NSE.

**H<sub>05</sub>:** Savings does not moderate the relationship between macroeconomic variables and stock market performance.

#### **1.5 Significance of the study**

This research study makes a valuable contribution to the existing body of theoretical and practical literature concerning the influence of macroeconomic variables on stock market performance. Specifically, it extends the current understanding of the Kenyan stock market by examining the impact of identified macroeconomic variables on stock market performance at the Nairobi Securities Exchange. The study aims to enhance the knowledge base by providing insights into the relationship between these variables and stock market dynamics in Kenya.

Moreover, this study offers significant benefits to investors by equipping them with better-informed decision-making capabilities. The findings furnish investors with crucial background information on how macroeconomic variables may affect their investments. As a result, investors are empowered to allocate attention to these variables and adopt strategies to diversify risks effectively within the stock market. Consequently, this research equips investors with a competitive advantage in terms of access to enhanced information for making informed investment decisions. Furthermore, future investors can utilize this study as a foundational reference to evaluate the potential impact of prevailing economic conditions on their investment choices.

In addition to its implications for investors, this study holds practical relevance for regulatory bodies such as the Capital Markets Authority and the Nairobi Securities Exchange. The insights derived from this research can inform the formulation and implementation of policies related to market regulation and trading practices at the Nairobi Stock Exchange. By incorporating the study's findings, these regulatory entities can enhance their decision-making processes, leading to more effective market oversight and governance.

Furthermore, the government stands to benefit from this study as well. The research findings can inform the development of favorable monetary policies that regulate macroeconomic variables. By ensuring stable and conducive economic conditions, these policies promote continual growth in investments and trading at the Nairobi Securities Exchange, contributing to overall economic growth.

## **1.6 Scope of the study**

This study aimed to find out the effect of the chosen macroeconomic variables; exchange rate, inflation rate, economic growth rate, and interest rates on stock market performance at the NSE. The researcher obtained the relevant information for the said independent variables from the

Kenya National Bureau of Statistics and the Central Bank of Kenya. Data for the dependent variable was obtained from the Nairobi Securities Exchange website. The study used data from the period 2000 to 2021 and the data of this study being secondary in nature was obtained from the mentioned NSE historical reports, the Central Bank of Kenya, and the Kenya National Bureau of Statistics. This period was justified because since early 1990s, the capital market has seen the great institutional, legal and policy reforms and it's the period within which the Kenya's vision 2030 was commissioned that aims at achieving an annual economic growth rate of ten percent mainly through mobilization of resources by the capital market.

### **1.7 Limitations and delimitations of the study**

The research discussed the limitations and delimitations on the effect of macroeconomic variables on stock market performance at the NSE with limitations of establishing causality between the variables and reliance on the available and accurate data, the limitation of generalizability of the findings to other markets and the potential presence of endogeneity issues. Regarding the delimitations, the research highlighted the specific timeframe of the study (2001- 2021), the selection of relevant macroeconomic variables, the chosen methodology and exclusion of some external factors. The study emphasized on the importance of acknowledging and addressing these limitations and delimitations to ensure transparency and provide a comprehensive understanding of the study findings.

### **1.8 Study organization and structure**

Five chapters formed the structure of the thesis. Chapter one covered the background, the problem statement, study objectives, hypotheses, significance, scope and organization of study. Chapter two reviewed related theories and empirical literature on the research topic, summarized the literature and Research gaps and the conceptual framework. Chapter three outlined the methodology was used to achieve the research objectives. This covered the research paradigm, research design empirical model, operationalization and measurement of

variables, target population, sampling design and procedures, data collection instruments and data analysis method. Chapter four presented the interpretation and discussion of the research findings. Chapter five outlined the summary, conclusion, policy implications and recommendations that were based on the research findings.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In this chapter, the researcher thoroughly explored the concepts and theories related to the influence of macroeconomic variables on stock market performance. The examination of relevant literature from past authors has served as the foundation for the theoretical and conceptual framework of the study. By synthesizing existing knowledge and insights, this chapter has provided a comprehensive understanding of the factors that impact stock market performance in Kenya.

#### **2.2 Theoretical Review**

In the theoretical review section of the study, three key theories were examined: the Efficient Market Hypothesis (EMH) theory, the Capital Asset Pricing Model (CAPM) theory, and the Arbitrage Pricing Theory (APT). Each of these theories was discussed in detail, outlining their core concepts and assumptions. The EMH theory posits that financial markets are efficient and incorporate all available information in the pricing of assets (Aukea et al., 2017).

The CAPM theory provides insights into the relationship between risk and expected returns, suggesting that investors require higher returns for assuming higher levels of risk (Choudhary et al., 2022). Lastly, the APT theory (Dada et al., 2021), expands on the CAPM by considering multiple risk factors that influence asset pricing. By reviewing and analyzing these theories, the study has established a strong theoretical framework for understanding the dynamics of stock market performance.

##### **2.2.1 Efficient Market Hypothesis**

According to Malkiel and Fama (1970), the Theory of the Capital Market built upon the earlier work of Markowitz (1952). The Efficient Market Hypothesis (EMH) is a financial theory that

asserts the impossibility of consistently "beating the market" due to the efficient nature of stock markets, which quickly incorporate and reflect all relevant information in stock prices. This implies that stock prices always reflect their fair value, making it challenging for investors to buy undervalued stocks or sell overvalued ones (Malini, 2019; Ejem et al., 2020).

The EMH suggests that it is not possible to outperform the overall market through expert stock selection or market timing, and the only way to achieve higher returns is by assuming additional risk. The hypothesis consists of three forms: weak, semi-strong, and strong (Rossi & Gunardi, 2018). The weak form suggests that past prices and returns do not influence future prices and returns. The semi-strong form states that publicly available new information is rapidly and accurately incorporated into prices. The strong form contends that all information, including insider information, is fully reflected in prices (Lekhal & El Oubani, 2020).

The theory asserts that existing stock prices fully account for the available information regarding a company's value. An efficient capital market ensures that market prices of securities consider all pertinent information to avoid generating unwarranted earnings. Brealey, Myers, and Allen (2011) define market efficiency as the inability for an investor to earn excessive returns, with returns being equal to the market return. The fair value of shares is determined by the anticipated future cash flows discounted at a cost of capital. According to Mishkin and Eakins (2006), for a market to be considered efficient, traded shares and stocks must fully reflect all available information at a given point in time.

The popularity of the Efficient Market Hypothesis increased in the 1980s (Shiller, 2003). In today's stock market, the EMH serves as a framework for understanding trading conditions and forms the basis of this study. The impact of macroeconomic variables on stock market performance is examined through the lens of the EMH, with the information flow of these variables influencing the stock market index (Gharaibeh et al., 2022).

Despite being a fundamental concept in financial theory, the EMH remains highly debated and controversial. Proponents argue that it is futile to search for undervalued stocks or attempt to predict market trends through fundamental analysis (Fievet & Sornette, 2016). Opponents believe that it is possible to outperform the market and that stocks can deviate from their fair values (Rossi & Gunardi, 2018). The application of the EMH to macroeconomic variables and stock market performance involves studying the relationship between these variables and stock market returns. According to the EMH, if markets are efficient, changes in macroeconomic variables should not systematically impact stock market returns (Malini, 2019).

However, empirical studies have found evidence of a relationship between macroeconomic variables such as interest rates, inflation, economic growth, and stock market returns. The relationship is complex, nonlinear, and varies across countries and time periods (IMF, 2021). For example, George et al. (2020) found that interest rates and economic growth positively impact stock market returns, while inflation has a negative impact. These findings suggest that the EMH may not perfectly capture the relationship between macroeconomic variables and stock market performance.

Regarding exchange rates, the EMH suggests that exchange rates should immediately adjust to new information. This implies that any news or events affecting a country's economy or financial markets should swiftly manifest in the exchange rate (Lekhal & El Oubani, 2020). For instance, if there is positive news about a country's economic performance, its currency should appreciate relative to other currencies, assuming all other factors remain constant. In terms of stock market performance, the EMH posits that stock prices already reflect all available information about a company, including its financial performance, market conditions, and other relevant factors (Rossi & Gunardi, 2018). Therefore, it becomes difficult for investors to consistently earn excess returns by trading based on information that is already priced into the stock.

### **2.2.2 Capital Asset Pricing Model**

The Capital Asset Pricing Model (CAPM), developed by Sharpe (1964), Linter (1965), and Mossin (1966), examines how risk influences the expected return of an investment relative to the market portfolio. The model incorporates a risk-free security, which has zero variance in its return, and distinguishes between different types of investors based on their risk-taking abilities (Agrawal & Matsa, 2013).

According to the CAPM, the expected return of an asset is determined by its riskiness, measured by the variance of its historical rate of return relative to its asset class (Belas et al., 2020). The model establishes a link between risk and return, categorizing risks into systematic risks that affect the entire economy and specific risks that impact only particular industries. Based on the level of risk an investor is willing to assume, the model defines how the expected return would vary (KUEHN et al., 2017).

The CAPM is a widely used model in finance that calculates the expected return of an asset by considering its risk and the expected return of the overall market. It posits that investors demand higher returns for riskier assets and lower returns for less risky assets. While the CAPM is useful for assessing the expected return of an asset and comparing it to other investments, it has limitations such as assuming rational investors with the same level of risk aversion (Choudhary et al., 2022).

In the context of macroeconomic variables and stock market performance, researchers have employed the CAPM to explore the relationship between various macroeconomic factors and stock returns. Studies have examined the impact of inflation and interest rates on stock returns using the CAPM, finding positive associations between inflation and stock returns and negative associations between interest rates and stock returns, particularly for firms with higher betas (Belyaeva, 2018; Hans, 2018; Cepel et al., 2019; Belas et al., 2020).

Regarding exchange rates and stock market performance, the CAPM provides insights into how investors value stocks in different currencies. The model suggests that the expected return of a stock should consider its risk relative to the overall market, incorporating the currency risk associated with holding the stock in a specific currency (Cepel et al., 2019). Inflation can impact the CAPM by influencing the risk-free rate of return, which may increase as inflation rises, thereby affecting the cost of capital and stock prices.

Economic growth rate can impact the CAPM by influencing the expected market return, which may increase with strong economic growth, leading to higher expected returns on stocks and impacting their prices. Similarly, interest rates can impact the model by affecting the risk-free rate of return, potentially increasing the cost of capital and influencing stock prices as interest rates rise (Belyaeva, 2018).

### **2.2.3 Arbitrage Pricing Theory**

The Arbitrage Pricing Theory (APT), developed by Ross (1976), is an extension of the Capital Asset Pricing Model (CAPM) that introduces a multi-factor approach to determine stock returns. Unlike the CAPM, which relies on a single factor, the APT incorporates several macroeconomic variables and their impact on stock returns (An, 2022). Investors prefer to have knowledge of how multiple factors affect their returns rather than taking uncalculated risks without certainty (French, 2017).

Chen, Roll, and Ross (1986) concluded that both expected and unexpected factors determine the returns on an asset. The economic environment strongly influences investment returns, and unanticipated risks directly affect portfolio returns. However, returns can also be influenced by risks specific to a particular industry rather than the overall economy (Dada et al., 2021). To improve investment returns, investors need to diversify their choices and select a portfolio that is not directly affected by the same types of risks.

The APT asserts that asset returns are the result of a linear expression of multiple factors and assumes a competitive market. This theory helps forecast the effect of macroeconomic variables on stock market returns (Ross, 1976). It serves as an alternative to the CAPM, which explains asset returns based on systematic risk measured by beta. Unlike the CAPM, the APT allows for the influence of multiple factors on asset returns (French, 2017; An, 2022).

However, there are several criticisms and limitations of the APT. The APT model is more complex than the CAPM because it involves estimating the sensitivity of an asset's returns to multiple factors, making it more challenging to implement and interpret (Aukea et al., 2017). Additionally, the model assumes that the returns of an asset are influenced by a specified set of factors. If important factors are omitted from the model, it can lead to omitted variable bias, causing the model's results to deviate from the true relationship between the asset's returns and the relevant factors (Aukea et al., 2017).

In macroeconomics, one of the main applications of the APT is explaining the relationship between stock market performance and macroeconomic variables. According to the APT, stock market performance is directly affected by macroeconomic variables such as GDP growth, inflation, and interest rates (Carvalho et. al., (2018). Higher GDP growth generally leads to better company earnings and higher stock prices. Likewise, lower inflation reduces costs for companies, resulting in higher stock prices (Dada et al., 2021). The APT also suggests that countries with higher GDP growth tend to have better-performing stock markets, and countries with lower inflation have better-performing stock markets compared to those with higher inflation (Pham, 2020).

Exchange rates play a crucial role in the APT model, as changes in exchange rates can impact companies' performance in various ways. Exchange rates can be considered one of the underlying macroeconomic factors influencing the returns of a given asset (Dada et al., 2021).

Fluctuations in exchange rates can affect the sensitivity or loading of the asset to exchange rate movements, thereby impacting its returns. Similarly, inflation can influence the APT model by being one of the included factors. Changes in inflation rates may affect the expected returns of the asset if inflation is considered in the APT (Carvalho et. al., (2018).

Economic growth rate is another factor that can influence the APT model. It can be considered as one of the underlying macroeconomic factors affecting the returns of an asset. As the economic growth rate increases, the sensitivity or loading of the asset to economic growth may increase, impacting its returns. Interest rates can also impact the APT model as one of the underlying macroeconomic factors affecting asset returns (Pham, 2020). Increase in interest rates can lead to an increased sensitivity or loading of the asset to interest rates, thus impacting its returns.

## **2.3 Empirical review**

### **2.3.1 Exchange rates and the stock market performance**

According to Sifunjo and Mwasaru (2012), their study examined the causal relationship between foreign exchange rates and stock prices in Kenya. They found that the variables of foreign exchange rates and stock prices were non-stationary and integrated of order one. The study also tested for co-integration between the two variables, which was confirmed. As a result, the researchers used error-correction models instead of classical Granger-causality tests to analyze the relationship. Their empirical results indicated that foreign exchange rates Granger-caused stock prices in Kenya, demonstrating a unidirectional causality from exchange rates to stock prices.

In the study conducted by Ming-Shiun et al. (2007), they aimed to explore the dynamic linkages between exchange rates and stock prices in East Asian markets, specifically focusing on the relationship with global gold prices, crude oil prices, USD-INR exchange rate, and the Indian stock market. Their analysis involved employing DCC-GARCH models to examine

contemporaneous linkages and conducting symmetric and asymmetric Non-Linear Causality tests to investigate lead-lag linkages. The empirical findings revealed that a decrease in gold prices and crude oil prices led to a decline in the value of the Indian Rupee and the benchmark stock index, Sensex. The study also highlighted the growing significance of gold as an investment asset class and emphasized the need for dynamic policymaking in India to manage exchange rate fluctuations and stock market volatility by considering gold and oil prices as important indicators.

In Ndegwa's study (2016) on the effect of macroeconomic variables on stock market returns, it was concluded that the selected macroeconomic variables had a weak positive effect of 15.7% on stock returns during the period from July 2011 to June 2016. The impact varied across variables, with money supply showing a positive effect on stock returns, the exchange rate having a negative effect, and the CBK lending rate exhibiting a weak positive effect. These findings suggest conflicting conclusions regarding the relationship between exchange rates and stock market returns, prompting the study to further investigate the effect of exchange rate changes on stock market performance at the NSE.

### **2.3.2 Inflation Rate and stock market performance**

According to Kasuvu (2012), the effects of inflation on investment in treasury securities by commercial banks in Kenya were examined. The study employed a descriptive survey methodology and analyzed data from the period spanning 2001 to 2011. The findings of the study indicate that there is no significant relationship between the inflation rate and investment in treasury securities by commercial banks in Kenya. Additionally, the study found no significant relationship between the level of investment in treasury securities by commercial banks and the lending rates offered by Kenyan banks. However, a significant relationship was observed between the level of investment in treasury securities and the maturity periods of treasury bonds.

Carvalho et. al., (2018) studied the relationship between inflation and economic development. The literature was largely silent regarding both the theoretical and empirical perspectives that undeveloped countries endure higher average inflation than developed economies. It thus presented a simple theoretical model linking the inflation phenomenon to the tradition of development economics. Empirical evidence was garnered to test the hypothesis that economic development engenders a downward bias to inflation rates.

Through the feasible GLS estimator in a panel of 65 countries from 2001 to 2011, research aimed at listing a number of variables most commonly used to explain differences in the stage of economic development across countries and identifying the most statistically relevant ones to account for differences in inflationary patterns (Carvalho et. al., (2018)). While the results showed that inflation is inversely correlated with the level of the technological content of the economy, human capital, and cyclical unemployment, it is directly related to the degree of inflation persistence and terms of trade growth.

In a study conducted by Otieno et al. (2019), the impact of the inflation rate on stock market returns in Kenya was investigated. The research analyzed the stochastic properties of the inflation rate, stock market returns, and their cointegrating residuals using monthly data from 1993 to 2015. To determine the integration orders of the variables and cointegrating residuals, the study employed the Autoregressive Fractionally Integrated Moving Average (ARFIMA)-based exact maximum likelihood estimation.

The results obtained from the ARFIMA model revealed that the month-on-month inflation rate, year-on-year inflation rate, and stock market returns exhibited non-integer orders of integration. This finding differed from the stationary/nonstationary results commonly obtained from conventional unit root tests, indicating that shocks to the variables were highly persistent but eventually dissipated over time. The study also found that the cointegrating residuals displayed non-integer orders of integration, suggesting that deviations from the long-run

equilibrium were prolonged, contradicting the assumption made in conventional cointegration frameworks. Furthermore, the Fractionally Integrated Error Correction Model (FIECM) analysis indicated that the year-on-year inflation rate had a positive Granger causality effect on stock market returns.

### **2.3.3 Interest rates and stock market performance**

Chirchir (2013) conducted a study to investigate the relationship between changes in interest rates and stock prices in Kenya. The research covered the period from October 2002 to September 2012, using the weighted average lending rate by commercial banks as a representation of interest rates and the NSE 20 share index as a proxy for stock prices. The study employed the Toda and Yamamoto (1995) method to determine the relationship between these variables. The results revealed that there was no significant causal relationship between interest rates and share prices.

However, it was observed that when interest rates increased, share prices tended to decline, which aligns with the expected relationship proposed by Fama (2018). The relationship between stock prices and interest rates has been extensively studied in economic literature. Amassoma et al. (2018) examined the relationship between the yield spread and stock market returns, suggesting that variables used to predict excess returns in the term structure also predict excess stock returns. Their results supported the effectiveness of the term structure of interest rates in predicting excess returns in the US stock market. Bhuiyan et al. (2020) also investigated the relationship between interest rates and stock prices using regression analysis.

Uddin and Alam (2010) explored the impacts of interest rates on the stock market, specifically focusing on the Dhaka Stock Exchange. Their study highlighted the significance of stock exchanges and interest rates in the economic growth of a country. They also emphasized the implications of interest rates on monetary policy, risk management practices, financial securities valuation, and government policies toward financial markets. In another study, Kori

(2018) examined the linear relationship between share prices and interest rates in both developed and developing countries. The findings showed a significant negative relationship between interest rates and share prices in various countries.

Ahmed (2019) examined the relationship between interest rates and stock market performance in developed and emerging markets, revealing a negative relationship between the two variables. Similarly, Ahmed (2018) studied the relationship between interest rates and stock market volatility in the US and UK, finding a positive relationship between interest rates and stock market volatility. Chen and Li (2017) analyzed the relationship between interest rates and stock market returns in the US, Europe, and Asia, discovering a negative relationship between interest rates and stock market returns across all three regions.

#### **2.3.4 Economic Growth and stock market performance**

The study by Nyanaro and Elly (2017) focuses specifically on the East African Community and investigates the relationship between stock market performance variables (market capitalization and liquidity) and economic growth. Their findings suggest a long-term relationship between these stock market variables and economic growth in the region. However, they find no relationship between share price volatility and economic growth.

Enisan and Olufisayo (2011) expand the analysis to sub-Saharan African countries and examine the long-run and causal relationship between stock market development and economic growth. They find evidence of cointegration between stock market development and economic growth in Egypt and South Africa. The study also suggests that stock market development has a significant positive long-run impact on economic growth in these countries. However, the relationship between stock market development and economic growth is found to be bidirectional in Cote D'Ivoire, Kenya, Morocco, and Zimbabwe.

Ibrahim (2019) investigates the influence of macroeconomic forces on stock prices, emphasizing their impact on expected future cash flows. The study suggests that macroeconomic fluctuations can have systematic influences on stock prices through their effect on future cash flows and the discounting rate. This perspective contrasts with the argument made by Singh that macroeconomic activities have a greater influence on the interaction between stock markets and economic growth.

Guru and Yadav (2018) explore the relationship between financial development and economic growth in the BRICS economies using banking sector and stock market development indicators. Their findings indicate that both banking sector development and stock market development indicators are positively and significantly associated with economic growth. The study suggests that these indicators are complementary to each other in stimulating economic growth.

The studies you have mentioned highlight the existence of dynamic linkages between stock markets and macroeconomic variables, with varying findings depending on the region and the specific variables considered. While the literature on this topic is more extensive for developed markets, there is a growing interest in investigating these linkages in emerging markets and less developed countries. Challenges such as government influence in economic activity, low trading volume, and limited company-specific information in these markets are cited as reasons for the relatively limited literature in this area. Nonetheless, the assumption that the relationship between macroeconomic variables and stock returns is unidirectional from macroeconomic variables to stock returns is subject to further examination and exploration.

### **2.3.5 Savings and Stock Market Performance**

Chen, Shiu-Sheng, and Chien-Chiang Lee (2009), study on Savings and stock market performance in the OECD countries, examined the impact of national savings on stock market

performance across 21 OECD countries. They found a positive and significant relationship between national savings rates and stock market performance. The results suggest that higher levels of savings contribute to stronger stock market performance. Balaban, Ercan, and Serdar Özkan (2010), study on Savings and stock market performance: Evidence from Turkey," investigated the relationship between savings and stock market returns in Turkey. The findings indicated a positive and significant long-run relationship between savings and stock market performance. The authors concluded that higher savings rates are associated with increased stock market returns in the Turkish context.

Additionally, Gul, Ejaz, et al. (2017) In their study Savings and stock market development: Evidence from emerging economies, examined the relationship between savings and stock market development across 20 emerging economies. The findings suggested a positive and significant relationship between savings rates and stock market development. Higher savings rates are associated with increased market capitalization, liquidity, and trading activity in the stock markets of emerging economies.

Adegbemi, Oluwatosin, et al. (2019), study on Savings and stock market performance in Nigeria, investigated the relationship between savings and stock market performance in Nigeria. The results showed a positive and significant long-run relationship between savings and stock market performance. The findings suggested that higher savings rates contribute to improved stock market performance in the Nigerian context. This was also supported by Imran, Muhammad, et al. (2021): In their study Savings, stock market development, and economic growth: Evidence from South Asian countries, the authors analyzed the relationship between savings, stock market development, and economic growth in South Asian countries. The findings revealed a positive and significant relationship between savings rates and stock market development. Furthermore, they find that stock market development moderates the relationship between savings and economic growth in the South Asian context.

These empirical studies collectively highlight the positive relationship between savings and stock market performance. Higher savings rates tend to be associated with stronger stock market performance, including increased market capitalization, liquidity, trading activity, and stock market development. However, it is important to note that the specific findings and the nature of the relationship may vary across countries and contexts, and other factors such as institutional quality, regulatory frameworks, and investor sentiment can also influence stock market performance.

#### **2.4 Critiques of Existing Literature**

According to a study conducted by Kutan et al. (2016), researchers have expressed a lack of consensus on the causal direction between macroeconomic variables, such as GDP growth, inflation, and interest rates, and stock market performance. The researchers attribute this lack of consensus to the intricate and dynamic nature of the relationship between these variables and the stock market, which presents challenges in establishing a clear causal link.

In a separate study by Cai et al. (2018), it was found that existing literature predominantly concentrates on developed markets, paying limited attention to emerging markets. This limited focus poses a problem as emerging markets possess distinct economic conditions and institutional frameworks, which can significantly impact the relationship between macroeconomic variables and stock market performance.

Faff et al. (2015) observed that the impact of global events, such as financial crises, political instability, and natural disasters, on stock market performance has largely been disregarded in existing literature. The researchers emphasized the importance of considering these events as they can have a substantial influence on the relationship between macroeconomic variables and stock market performance.

Chen et al. (2019) noted that traditional statistical methods, like linear regression, have primarily been employed in analyzing the relationship between macroeconomic variables and stock market performance. However, they highlighted that these methods may not fully capture the intricate and dynamic nature of the relationship. They suggested that the utilization of advanced statistical methods, such as machine learning and artificial intelligence, could potentially offer a more accurate analysis.

Similarly, Li et al. (2020) found that existing literature heavily relies on historical data when examining the relationship between macroeconomic variables and stock market performance. However, they cautioned that this approach may not fully encompass the current market conditions. They proposed that incorporating real-time data could yield a more precise analysis.

## 2.5 Summary of literature review and research gap

From the study of the literature review theory and empirical literature, the study establishes the following research gaps that it intends to fill: -

**Table 2.1: Summary of Literature and Research Gaps**

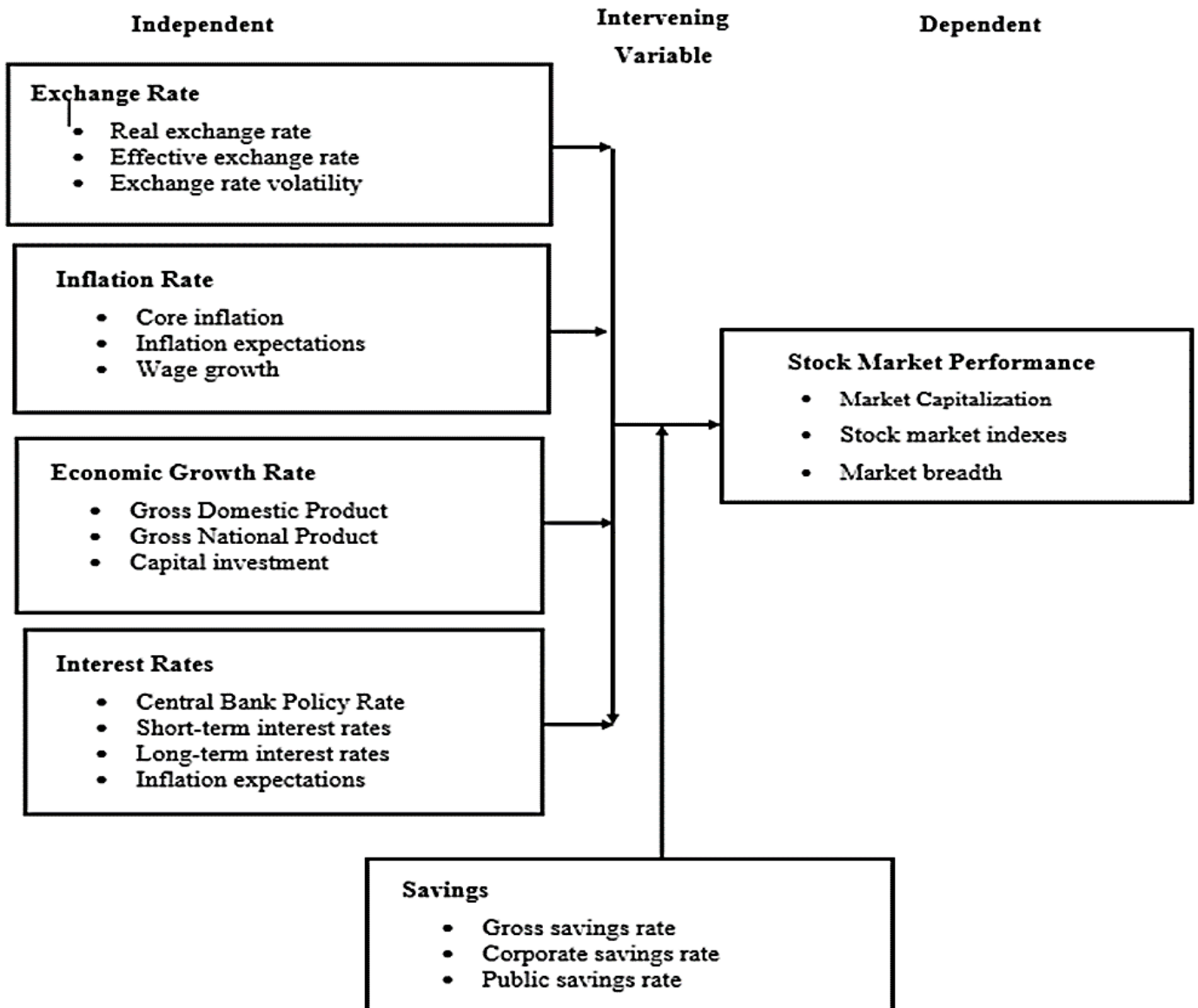
Author	Study	Methodology	Findings	Research gaps	Addressing the research gap
Oketch et. al., (2016)	Effect of Macroeconomic Variables on Stock Returns of Listed Commercial Banks in Kenya	Correlation analysis and Unit Root test	Interest rate, exchange rate and inflation have significant impact on bank stock return, while GDP had an insignificant impact at 5% level of significance.	❖ Contextually addressed only listed banks on the NSE	❖ Will establish the overall performance of NSE ie market capitalization
Laichena and Obwogi (2015)	Effects of macroeconomic variables on stock returns in the East African	Descriptive analysis and panel data regression analysis	From the results, there was a significant relationship between the macroeconomic variables	❖ Failed to show the direction of the link between	❖ Demonstrate the direction of the link by focusing on NSE Kenya.

	community stock exchange market		in the study and stock returns in East Africa.	independent countries NSE vs their stock market performance	
Ouma and Muriu (2014)	The impact of macroeconomic variables on stock market returns in Kenya	Empirical Analysis	- Money supply and inflation are found to be significant determinants of the returns at NSE. -Exchange rates were found to have a negative impact on stock returns, while interest rates are not important in determining long run returns in the NSE.	❖ Failed to show the direction of the link between macroeconomic variables and stock market performance	❖ Show the direction of the link through the mediation of variable.
Elizabeth Wanjiku (2014)	The effect of macroeconomic variables on portfolio returns of the pension industry in Kenya	Descriptive study design	- Established exchange rates, inflation rates and interest rates to be the macroeconomic factors that have an inverse relationship with pension funds' returns, with GDP growth having a direct relationship.	❖ Focused majorly on macroeconomic variables on portfolio returns of the pension industry in Kenya	❖ Will establish the overall performance of NSE ie market capitalization
Ester Nyambura Ndegwa (2016)	Effect of macroeconomic variables on stock market returns	Descriptive study design	- Macroeconomic variables had a weak positive effect of 15.7% on the stock returns for the period	❖ Used on Descriptive study design for methodology	❖ Will use correlational research design and ARDL test

<p>Kirui et. al., (2021)</p>	<p>Macroeconomic Variables, Volatility and Stock Market Returns: A Case of Nairobi Securities Exchange, Kenya</p>	<p>Threshold Generalized Autoregressive Conditional Heteroscedasticity (TGARCH) model</p>	<p>The results of the TGARCH model for exchange rate, Gross Domestic Product and Treasury bill rate revealed that the impact of news was asymmetric and there was presence of leverage effects. There was absence of volatility persistence among all the macroeconomic variables.</p>	<p>❖ Failed to show the direction of the link between macroeconomic variables Volatility and stock market performance</p>	<p>❖ Show the direction of the link through the mediation of variable.</p>
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## 2.5 Conceptual Framework

The conceptual framework is the researcher's conceptualization of the relationship between the variables under study. The study conceptualizes the relationship between macroeconomic variables and stock market performance.



**Figure 1.1: Conceptual Framework**

According to Figure 1.1, an exchange rate represents the rate at which one currency can be exchanged for another. It is a macroeconomic variable that plays a crucial role in determining the relative prices of goods and services between countries, as well as shaping the overall balance of trade and investment flows. The exchange rate can be influenced by factors like

interest rates, inflation, economic growth, and political stability. Depending on the economic policies implemented by the countries involved, exchange rates can be either fixed or floating.

The inflation rate, as explained, is the rate at which the general level of prices for goods and services increases, resulting in a decrease in purchasing power. It is a measure of the price changes over time, typically calculated as a percentage change in a price index like the Consumer Price Index (CPI) or the Producer Price Index (PPI). As a macroeconomic variable, the inflation rate holds significance as it can have a significant impact on the overall health of an economy. High inflation rates can reduce consumers' purchasing power, making it challenging for businesses to plan for the future. Moreover, it can lead to decreased investment and economic growth. Conversely, low inflation or deflation can result in economic stagnation and job losses. Governments and central banks employ monetary and fiscal policies to target an inflation rate consistent with price stability and economic growth.

The economic growth rate measures the increase in the value of goods and services produced by an economy over a specific period, typically represented as a percentage change in the Gross Domestic Product (GDP). It is a key macroeconomic variable that indicates the overall health and prosperity of an economy. A positive economic growth rate suggests an expanding economy and increased wealth creation, while a negative rate implies economic contraction and wealth loss. Economic growth is significant as it is closely linked to various other macroeconomic variables such as employment, inflation, and living standards. Furthermore, it plays a vital role in determining the overall well-being of society.

Interest rates represent the cost of borrowing money, usually expressed as a percentage of the principal loan amount. They indicate the rate at which financial institutions lend money to

borrowers. As a macroeconomic variable, interest rates have a critical impact on the economy by influencing borrowing levels, investment, and consumption. Higher interest rates increase borrowing costs, leading to reduced spending and investment, which can subsequently dampen economic growth. Conversely, lowering interest rates makes borrowing cheaper, stimulating increased spending and investment, thereby promoting economic growth. Central banks, like the Federal Reserve in the United States, utilize monetary policy tools such as setting the target for the federal funds rate to influence interest rates in the economy.

Savings refers to the portion of disposable income that individuals do not spend on consumption but set aside for future use. In macroeconomics, savings is considered a key variable that influences economic growth and stability. It can take the form of physical savings, such as cash in a bank account, or financial savings, such as stocks, bonds, or mutual funds. High levels of savings can lead to increased investment and economic growth, whereas low levels of savings can result in decreased investment and economic growth. Various macroeconomic factors, such as interest rates, income levels, and consumer confidence, can influence savings.

The performance of the stock market, as indicated by stock indices, is regarded as a macroeconomic variable as it reflects the overall health and anticipated future performance of the economy. A rising stock market generally indicates a robust economy and investor confidence, while a declining stock market suggests a weak economy and a lack of investor confidence. However, it is important to note that stock markets are not a perfect reflection of the economy, as they can be influenced by factors like individual company performance, global events, and speculative activities. Table 2.2 summarizes the operationalization of the independent variables for the study.

**Table 2.2: Table showing the Operationalization of Variables**

<b>Variable</b>	<b>Objective</b>	<b>Indicators</b>	<b>Measurement Scale</b>
Exchange Rate	To assess the effects of exchange rate on stock market performance on the NSE	The value of one currency in relation to another currency, indicators include: - Balance of Trade: Interest rates: Inflation: Money supply: Gross Domestic Product (GDP) growth: Capital flows.	Numerical
Inflation Rate	To assess the effect of the inflation rate on Stock Market Performance on the NSE	The dimensions of inflation rates in terms of Consumer Price Index (CPI): Producer Price Index (PPI): Gross Domestic Product (GDP) Deflator: Money Supply: Interest rates: Commodities prices and Exchange rate.	Numerical
Economic Growth Rate	To assess the effect of economic growth rate on Stock Market Performance on the NSE	A measure of the change in the size of an economy over a period of time, indicators here include: - Real GDP: Gross National Product (GNP): Gross Domestic Income (GDI): Employment: Consumer Spending: Investment: and Trade.	Numerical
Interest Rate	To determine the effect of interest rates on Stock Market Performance on the NSE	Interest rates are economic indicators that measure the cost of borrowing money, and they can have a significant impact on the economy including: - Treasury yields: Prime rate: Consumer price index (CPI): Investment: Consumer spending: Stock market: Credit and Monetary policy.	Numerical
Savings	To determine how savings as a mediation variable intervenes between the dependent and independent variable.	To analyze saving as an intervening variable, statistical method known as mediation analysis will be used. Mediation analysis involves estimating the direct effect of the independent variable on the dependent variable, as well as the indirect effect of the independent variable on the dependent variable through the intervening variable (in this case, saving). The total effect of the independent variable on the dependent variable is then decomposed into its direct and indirect effects.	Numeric

## **CHAPTER THREE**

### **3.0 RESEARCH METHDOLOGY**

#### **3.1 Introduction**

In this chapter, the researcher discussed the methodology employed in this study. The primary objective was to provide an in-depth description of the research design, population, sampling approach, data collection methods, research procedures, and data analysis techniques utilized throughout this study.

#### **3.2 Research Design**

Research design encompasses the plan, structure, and strategy employed in a research endeavor. It serves as a blueprint that guides the entire research process, providing a clear framework for data collection and analysis. According to Saunders, Lewis, and Thornhill (2016), research design acts as a framework for gathering and analyzing data to address research questions and achieve research objectives. It also offers a rational justification for selecting specific data sources, as well as the techniques employed for data collection and analysis.

The research study utilized a correlational research design, which focused on examining the relationship between two or more variables (Fields & Schaffer, 2015; Seeram, 2019). The primary objective of correlational research is to assess the degree of association between variables (Babbie, 2017). However, it is important to note that this type of research design does not establish causality between the variables under investigation (Bloomfield & Fisher, 2019). The process of conducting a correlational research design involves several steps. These steps include formulating the research question, selecting a sample, measuring the variables, collecting data, analyzing the data, interpreting the results, and drawing conclusions.

Correlational studies serve as a valuable tool for understanding the relationships between variables across various contexts (Fields & Schaffer, 2015). In the present study, the choice of a correlational research design offers several benefits. Firstly, it is a non-invasive approach that does not require manipulation of variables, making it an ethical and less intrusive method (Bloomfield & Fisher, 2019). Additionally, correlational studies are often employed to investigate relationships in real-world scenarios, offering insights into everyday phenomena.

This study aimed to examine the effects of macroeconomic variables on stock market performance in the case of the NSE (Nairobi Stock Exchange). By utilizing a correlational research design and analyzing secondary data, the researcher can report on observed situations and provide relevant statistical information. The primary objective is to gain a clear understanding of the effects and relationships between macroeconomic variables and stock market performance on the NSE. This research design will facilitate the achievement of that objective.

### **3.3 Philosophy of the Methodology**

Positivism is a philosophical approach that underscores the importance of empirical evidence and scientific methods in comprehending the world. It asserts that knowledge should be derived from objective facts and observable, measurable data (Sager, 2021). Within the realm of secondary research, a positivist approach commonly entails the collection and analysis of quantitative data from reputable sources like government statistics, scientific studies, and surveys. The objective is to utilize this data to identify patterns and relationships that can be objectively measured and tested (Mugenda and Mugenda, 2014).

Positivism operates under the assumption that there exists a singular, objective truth that can be uncovered through the application of scientific methods. This approach often involves the utilization of statistical analysis to test hypotheses and formulate predictions regarding the

behaviors of individuals and groups (Gujarati, 2003). While positivism has faced criticism for its emphasis on quantitative data and its failure to consider the subjective experiences of individuals, it continues to be widely employed in various fields, including the social sciences and public health. By relying on objective and empirical data to guide decision-making, researchers can make more precise predictions and enhance outcomes for both individuals and society as a whole (Sager, 2021).

### **3.4 Target Population**

The target population, as defined by Borg et al. (2007), refers to the complete group of individuals, events, or entities that a researcher aims to investigate. In this study, the target population was the Nairobi Securities Exchange (NSE). The data for stock market performance was collected from reliable sources such as the NSE website and published reports. Information on the inflation rate and exchange rates, was sourced from the Kenya National Bureau of Statistics and the Central Bank of Kenya who provide authoritative data on economic indicators, making them appropriate sources for the study.

### **3.5 Data collection**

The researcher obtained a research permit from the National Commission for Science, Technology, and Innovation, which allowed them to collect data from the annual published reports of the Kenya National Bureau of Statistics, Nairobi Securities Exchange, and Central Bank of Kenya for the period 2000-2021. The researcher used a data abstraction tool (appendix 1) to collect and compile the required data for analysis.

### **3.6 Reliability and Validity**

According to the researcher, reliability refers to the consistency of results when the same test is conducted under different circumstances and using the same methods. A research study is considered reliable if it consistently produces similar results and maintains measurement stability over time. In this particular study, reliability of the results will be ensured by analyzing

data obtained officially from the Kenya National Bureau of Statistics, Nairobi Securities Exchange, and Central Bank of Kenya for the period 2000-2021. Furthermore, the researcher noted that the data can be accessed by other researchers and readers, allowing for further verification and analysis from these reliable sources, thereby enhancing the overall reliability of the study's results.

The researcher also highlighted the importance of validity, which refers to whether an instrument effectively measures what it is intended to measure. To ensure construct validity in this study, the researcher incorporated significant variables from multiple previous studies that employed the same test as the one being evaluated. By using established variables and drawing upon the literature, the study sought to enhance the validity of its findings.

### **3.7 Data Analysis and Presentation**

The researcher analyzed the data using correlation analysis and time series multiple regression analysis. EViews version 9.0 was used as a tool for this analysis. Descriptive statistics was employed to provide a summary of stock market performance at the Nairobi Securities Exchange. The Pearson correlation matrix was used to determine the strength of the relationship between stock market performance and macroeconomic variables. Additionally, the study addressed potential violations of assumptions of the classical linear regression model and performed a unit root test.

Based on the outcome of the unit root test, the researcher applied the ARDL bound test to establish whether a long-run co-integration relationship exists between the macroeconomic variables and stock market performance. Regarding the unit of analysis, the researcher obtained data from the Nairobi Securities Exchange website on the market capitalization and applied the following regression model:

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \epsilon$$

Where:

**Y**- Stock Market Return- percentage change in market capitalization at NSE.

**X<sub>1</sub>**- Exchange rate- growth change in US dollar exchange rate.

**X<sub>2</sub>**- Inflation rate- percentage change in the consumer price index

**X<sub>3</sub>**- Economic growth rate

**X<sub>4</sub>**- Interest rates

**X<sub>5</sub>** - The intervening variable (saving)

**$\alpha$** - constant coefficient of the firms under study and;

**$\beta$** - Determines the relationship between the independent variable and the dependent variable or the gradient of the regression measuring the amount of the change in Y associated with a unit change in X.

**$\epsilon$** - Error term

### **3.7.1 Diagnostic Test**

The researcher emphasized the importance of conducting diagnostic tests to verify that the assumptions of the Classical Linear Regression Model are not violated. They mentioned that if equation 3.7 is estimated when these assumptions are violated, the resulting estimates may not be the Best Linear Unbiased Estimate, as stated by Brooks (2008). The researcher outlined several diagnostic tests that will be performed, including tests for multicollinearity, heteroscedasticity, stationarity, and autocorrelation. These tests are vital for identifying any violations of the assumptions and ensuring the reliability of the regression analysis.

#### **3.7.1.1 Test for Multicollinearity**

Multicollinearity was described by the researcher as a situation in which two or more explanatory variables in the regression model are highly correlated, to the extent that one variable can be linearly predicted by another with some degree of accuracy (Wooldridge,

2002). Brooks (2008) suggested that the presence of multicollinearity can lead to a regression model with high R<sup>2</sup> and high standard errors, even though the coefficients of the explanatory variables are not statistically significant. This can have an impact on the precision and accuracy of accepting or rejecting the null hypothesis. In this study, a test for multicollinearity was conducted using the correlation coefficient test with a cutoff point of 0.8, as suggested by Gujarati (2003) and Cooper and Schindler (2008).

#### **3.7.1.2 Test for Heteroscedasticity.**

The researcher discussed the concept of heteroscedasticity, which refers to a situation where the error terms among different values of explanatory variables do not display constant variance. They mentioned that running a regression with heteroscedastic values would result in unbiased parameter estimates but invalid standard errors, as stated by Cooper and Schindler (2008). To test for heteroscedasticity, the researcher utilized the White test, as specified by White (1980). They explained that the null hypothesis would assume homoscedasticity, while the alternative hypothesis would indicate the presence of heteroscedasticity. If the null hypothesis is rejected, it would suggest the presence of heteroscedasticity. The researcher also mentioned that to address this issue, they would transform the variables into logarithmic form, as recommended by Brooks (2008).

#### **3.7.1.3 Stationarity Test**

Fadhili et al. (2011) explained that stationarity refers to a statistical characteristic of time series data, specifically the constancy of its mean and variance over time. If both the mean and variance remain constant over time, the series is considered a stationary process, indicating it is not a random walk and does not possess a unit root. Conversely, if the mean and variance exhibit changes over time, the series is categorized as a non-stationary process, indicating it is a random walk with a unit root. The researcher mentioned that conducting a regression analysis on non-stationary data would result in a spurious regression, as highlighted by Ojoko et al. (2014). A spurious or nonsense regression refers to a regression with a high R<sup>2</sup> and high

standard errors, despite the insignificance of the coefficients of the explanatory variables (Brooks, 2008).

The researcher performed the Phillip Perron unit root test to examine the stationarity of the data and determine the order of integration, which is an essential requirement for establishing co-integration relationships (John, Nelson & Reetu, 2005). They explained that the null hypothesis assumes that all data possess a unit root, while the alternative hypothesis suggests that none of the data have unit roots (Choi, 2001). If the null hypothesis is not rejected, it indicates that the data is non-stationary and needs to be differenced before running a regression analysis to achieve stationarity (Gujarati, 2003). The researcher mentioned that if a series is stationary without any differencing, it will be designated as I (0), or integrated of order 0. Conversely, if a series becomes stationary after first differencing, it will be designated as I (1), or integrated of order 1 (Shabaz et al., 2015).

#### **3.7.1.4 Test for Auto Correlation**

According to Perger et. al., (2021), autocorrelation, also known as serial correlation, refers to the degree of correlation of the same variables between two successive time intervals. The value of autocorrelation ranges from -1 to 1. A value between -1 and 0 represents negative autocorrelation. A value between 0 and 1 represents positive autocorrelation. Autocorrelation gives information about the trend of a set of historical data so that it can be useful in the technical analysis for the equity market.

The Durbin-Watson statistic is commonly used to test for autocorrelation (Turner., 2020). It can be applied to a data set by statistical software. The outcome of the Durbin-Watson test ranges from 0 to 4. An outcome closely around 2 means a very low level of autocorrelation. An outcome closer to 0 suggests a stronger positive autocorrelation, and an outcome closer to 4 suggests a stronger negative autocorrelation (Harisena et. al., 2021).

It is necessary to test for autocorrelation when analyzing a set of historical data. For example, in the equity market, the stock prices on one day can be highly correlated to the prices on another day. However, it provides little information for statistical data analysis and does not tell the actual performance of the stock (French., 2017). Therefore, it is necessary to test for the autocorrelation of the historical prices to identify to what extent the price change is merely a pattern or caused by other factors. In finance, an ordinary way to eliminate the impact of autocorrelation is to use percentage changes in asset prices instead of historical prices themselves (Smith T., 2022).

### **3.7.2 The ARDL-ECM Regression**

According to the studies conducted by Shabazz et al. (2013) and Ibenta (2012), it was noted that the presence of a long-run co-integrating equilibrium gives rise to short-run fluctuations. In order to address these fluctuations, Brooks (2008) suggests using a model that combines first differences and lagged levels of co-integrated variables. Hence, the researcher stated that for examining the effect of macroeconomic variables on stock market performance, they will employ the Autoregressive Distributed Lag (ARDL) model with an Error Correction term.

They mentioned that this model is considered most appropriate for several reasons. Firstly, it can be applied to a small sample size. Secondly, it estimates the short- and long-run components of the model simultaneously, thereby addressing issues related to omitted variables and autocorrelation. Thirdly, it provides unbiased estimates of the long-run model and valid t-statistics even when some of the regressors are endogenous. Lastly, the researcher highlighted that the ARDL model is suitable when the series being analyzed are integrated of different orders, excluding I(2) integration (Pesaran et al., 2001; Shabazz et al., 2015; Srinivasan et al., 2012).

The researcher emphasized that the Error Correction term plays a crucial role in estimating the speed at which a dependent variable returns to equilibrium after a change in the independent variable. Additionally, the individual coefficients of the difference terms capture the short-run dynamics of the model. This insight is supported by the studies conducted by Kemboi & Tarus (2012), Shabaz et al. (2015), Brooks (2003), and Werigbelegha & Igbodika (2015). Furthermore, Tandrayen-Ragoobur (2010), Srinivasan et al. (2012), and Shabaz et al. (2015) have indicated that the ARDL-ECM model is formulated as follows.

$$\Delta \ln MC_t = \beta_1 \Delta \ln FDE1_t + \beta_2 \Delta ML2_t + \beta_3 \Delta FOP3_t + \beta_4 \Delta EGA_t + \beta_5 \Delta IR5_t + \beta_6 (\ln MC_{t-1} - \gamma_1 \Delta \ln FDE1_{t-1} - \gamma_2 \Delta ML2_{t-1} - \gamma_3 \Delta FOP3_{t-1} - \gamma_4 \Delta EGA_{t-1} - \gamma_5 \Delta IR5_{t-1} - \gamma S_{t-1}) + \mu_t \dots \dots \dots 3.6$$

**Where: -**

$\Delta \ln MC_t$  - is the dependent variable (Stock Market Performance)

$(\beta_1 \Delta \ln FDE1_t ; \beta_2 \Delta ML2_t ; \beta_3 \Delta FOP3_t ; \beta_4 \Delta EGA_t ; \beta_5 \Delta IR5_t)$  – are the independent variables

$\Delta$  is the difference operator.

$\beta_1, \dots, \beta_5$  - are the short-run coefficients between X (macroeconomics variables) and Y (Stock Market Performance).

$\beta_6$  - is the speed of adjustment from the short-run state of disequilibrium to the long-run equilibrium state.

$\gamma_1, \dots, \gamma_4$  - are the long-run coefficients between X (macroeconomics variables) and Y (Stock Market Performance).

$S_{t-1}$  - is the residual from the first stage regression of saving on the independent variables.

$\gamma$  - is the coefficient that captures the effect of the intervening variable on the relationship between the independent variables and the dependent variable.

### **3.8 Ethical Considerations**

Ethics is a branch of philosophy that deals with the conduct of people and guides the norms or standards of behavior of people and relationships with each other (Blumberg et al, 2005). Some ethical considerations for the research included that the data used was confidential and sensitive, obtaining proper permissions from NACOSTI and citing sources appropriately, avoiding plagiarism, and ensuring that the data being used was relevant and reliable. The researcher also considered the potential impact of the research on any individuals or groups represented in the data to avoid misrepresenting the findings or drawing inappropriate conclusions. Additionally, the study was transparent about the methods and limitations and ensured that the research does not contribute to any harmful biases or stigmatization of certain populations. UMMA university post graduate's department together with the research project supervisors were involved in ensuring established ethics were followed.

**CHAPTER FOUR**  
**RESEARCH FINDINGS AND DISCUSSIONS**

**4.0 Introduction**

This chapter presents the research findings, their interpretation and discussion of the results for the study macroeconomics variables and stock market performance a case of Nairobi securities exchange. The findings are presented in form of tables and figures.

**4.1 Descriptive Statistics**

Descriptive statistics are used to analyze data in order to provide insights into patterns, trends, and relationships within the data. Commonly used measures of central tendency in descriptive statistics include mean, median, and mode, while measures of dispersion include range, variance, and standard deviation. They are also be used to identify the shape of the distribution of the data, which can be important in understanding the underlying patterns and trends within the data.

In order to ascertain the nature of the data used in the study, descriptive statistics were determined. The mean in this study was used to describe the typical or average value of a dataset, the Skewness was used to understand the shape of a dataset, while the standard deviation was used to understand the variability of a dataset (Mishra et.al., 2019; Witte, R., 2017). The results of the descriptive statistics are presented in table 4.1.

**Table 4.1: Descriptive Statistics Results**

<b>Variables</b>	<b>Observation</b>	<b>Mean</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Skewness</b>	<b>Standard Deviation</b>
<b>Economic Growth Rate</b>	22	4.238636	8.100000	-0.250000	-0.463050	2.286718
<b>Exchange Rates (Kes)</b>	22	86.31727	109.6300	67.31000	0.386389	13.04974

<b>Inflation Rate</b>	22	8.700000	26.24000	1.960000	1.966389	5.024344
<b>Interest Rates</b>	22	7.500182	17.81000	-10.09600	-0.840352	7.098834
<b>Market CAP (Kes BN)</b>	22	26.62311	44.1000	8.05435	-0.198752	9.341221

**Source: Study Analysis (2000-2021)**

From table 4.1 above, the mean economic growth rate for the sample was 4.24%, with a minimum of -0.25% and a maximum of 8.1%. The skewness value of -0.46 indicates that the distribution is slightly negatively skewed. The standard deviation of 2.29 indicates that there was some variability in the growth rate data. The mean exchange rate was 86.32 Kes, with a minimum of 67.31 Kes and a maximum of 109.63 Kes. The skewness value of 0.39 indicates that the distribution is slightly positively skewed. The standard deviation of 13.05 Kes indicates that there is a wide range of exchange rates in the sample.

On the inflation rate, the mean inflation rate was 8.7%, with a minimum of 1.96% and a maximum of 26.24%. The skewness value of 1.97 indicates that the distribution is highly positively skewed, suggesting that there may be some extreme values in the data. The standard deviation of 5.02 indicates that there was some variability in the inflation rate data. Consequently, the mean interest rate was 7.50%, with a minimum of -10.10% and a maximum of 17.81%. The skewness value of -0.84 indicates that the distribution is slightly negatively skewed. The standard deviation of 7.10 indicates that there is a wide range of interest rates in the sample.

Finally, on Market capitalization, the mean market capitalization was 26.59 billion Kes, with a minimum of 8.05 billion Kes and a maximum of 44.06 billion Kes. The skewness value of -0.20 indicates that the distribution is slightly negatively skewed. The standard deviation of 9.34 billion Kes indicates that there was some variability in the market capitalization data. The

descriptive statistics provide a snapshot of the key characteristics of the data in the sample, allowing for comparisons and identification of patterns and trends. The results suggest that the data for some variables may be skewed, and there is variability in the data for all variables.

#### 4.2 Correlation Analysis

Correlation analysis is a statistical technique that examines the strength and direction of the relationship between two variables (Kim & Yoon, 2018). According to Kim and Yoon (2018), correlation analysis "is used to investigate whether and to what extent a change in one variable is associated with a change in another variable" (p. 339). The study used Karl Pearson correlation matrix to explain the strength of the relationship between macroeconomics variables and stock market performance. The results are presented in the table 4.2

**Table 4.2: Pearson Correlation Matrix Result**

<b>Correlation</b>	<b>Economic Growth Rate</b>	<b>Exchange Rates (KES)</b>	<b>Inflation Rate</b>	<b>Interest Rates</b>	<b>Market CAP (KES_BN)</b>	<b>Savings</b>
Economic Growth Rate	1.000000					
Exchange Rates (KES)	0.067530	1.000000				
Inflation Rate	-0.106520	-0.484382	1.000000			
Interest Rates	-0.557208	0.122782	-0.039698	1.000000		
Market CAP (KES_BN)	0.323962	-0.117397	0.486457	-0.515749	1.000000	
Savings	-0.094991	-0.524989	-0.191281	-0.022464	-0.408412	1.000000

**Source: Study data (2023)**

From the findings on table 4.2 The results of the Pearson correlation matrix indicated that there was a weak positive correlation between Economic Growth Rate and Exchange Rates (KES)

( $r = 0.067$ ,  $p > 0.05$ ). Inflation Rate had a weak negative correlation with Economic Growth Rate ( $r = -0.107$ ,  $p > 0.05$ ) and a moderate negative correlation with Exchange Rates (KES) ( $r = -0.484$ ,  $p < 0.05$ ). Interest Rates had a strong negative correlation with Economic Growth Rate ( $r = -0.557$ ,  $p < 0.05$ ) and a weak positive correlation with Exchange Rates (KES) ( $r = 0.123$ ,  $p > 0.05$ ). Market CAP (KES\_BN) had a moderate positive correlation with Economic Growth Rate ( $r = 0.324$ ,  $p > 0.05$ ), a weak negative correlation with Exchange Rates (KES) ( $r = -0.117$ ,  $p > 0.05$ ), a moderate positive correlation with Inflation Rate ( $r = 0.486$ ,  $p < 0.05$ ), and a strong negative correlation with Interest Rates ( $r = -0.516$ ,  $p < 0.05$ ). The correlations between savings and other variables are also mentioned. It appears that savings have weak negative correlations with economic growth rate, exchange rates, inflation rate, interest rates, and market capitalization. However, none of these correlations are statistically significant at the 0.05 level.

Generally, the results suggest that there were weak to moderate relationships between the variables, with the strongest correlation observed between Market CAP (KES\_BN) and Interest Rates. The negative correlation between Interest Rates and Economic Growth Rate suggests that higher interest rates may lead to slower economic growth, while the positive correlation between Market CAP and Economic Growth Rate suggests that higher economic growth may lead to higher market capitalization. These findings are consistent with previous research on the relationship between economic growth and stock market performance. A study by Akhtar, Ali, and Sadaqat (2021) found a significant positive correlation between economic growth and stock market performance in Pakistan. Another study by Berument and Dincer (2005) found a negative relationship between inflation and economic growth in Turkey.

### **4.3 Diagnostic Test Results**

Diagnostic test results refer to the outcome of tests that are conducted to evaluate the validity, reliability, and accuracy of statistical models used in data analysis. These tests are used to

identify potential outliers, influential observations, and violations of model assumptions, among other things. Diagnostic tests are an important component of data analysis as they help to ensure that statistical models are sound and the results are trustworthy (Kabacoff, R., 2011). In order to ensure non-violation of assumption of CLRM diagnostic test were conducted. The tests included: multicollinearity test, test for autocorrelation, test for heteroscedacity, normality test, unit root test, co-integration test and model stability test.

### 4.3.1 Multicollinearity Test Results

Multicollinearity tests are used to evaluate the presence and severity of multicollinearity in statistical models. These tests provide information about the degree of correlation among the independent variables in the model. A common measure of multicollinearity is the variance inflation factor (VIF), which measures the degree to which the variance of the estimated regression coefficient is increased due to multicollinearity. The study used the correlation matrix to test for multicollinearity since it is considered a simpler easy approach (Brooks 2008). The explanatory variables used were Economic Growth Rate, Exchange Rates, Inflation Rate, Interest Rates, Savings and stock Market Performance. The results of the multicollinearity test were presented in the table 4.3 below.

**Table 4.3: Multicollinearity Test Results**

<b>Variable</b>	<b>Coefficient Variance</b>	<b>Uncentered VIF</b>	<b>Centered VIF</b>
C	197.6907	86.17462	NA
Interest Rates	0.071929	3.272017	1.508240
Inflation Rate	0.125406	5.454849	1.317243
Exchange Rates	0.018906	62.74254	1.339656
Economic Growth Rate	0.690454	6.909573	1.502276
Savings	0.683423	9.754943	1.201111

**Source: Study data (2023)**

Multicollinearity is a phenomenon that occurs when two or more independent variables in a statistical model are highly correlated with each other (Hasan & Hossain., 2020). When multicollinearity exists, it can be difficult to estimate the effect of individual independent

variables on the dependent variable. Therefore, it is important to detect and address multicollinearity in statistical models to ensure that the results are reliable and accurate.

Multicollinearity tests are used to evaluate the presence and severity of multicollinearity in statistical models. These tests provide information about the degree of correlation among the independent variables in the model. A common measure of multicollinearity is the variance inflation factor (VIF), which measures the degree to which the variance of the estimated regression coefficient is increased due to multicollinearity (Nasser & Yehia., 2017).

Multicollinearity test results typically provide information about the magnitude of the VIF for each independent variable in the model. A VIF value of 1 indicates no multicollinearity, while values greater than 1 indicate increasing levels of multicollinearity. Generally, a VIF value of 5 or higher indicates significant multicollinearity that may need to be addressed. In addition to VIF, other diagnostic tests can also be used to evaluate multicollinearity, such as tolerance and condition number.

The results from table 4.3 above show that the variables have VIF values ranging from 1.317 to 1.508, indicating no evidence of multicollinearity in the model. Therefore, it was reasonable to conclude that multicollinearity was not a significant issue in this study. The coefficient for the variable "Savings" is 0.683423. This indicates the expected change in the dependent variable for a one-unit increase in savings while holding other variables constant. The uncentered VIF value is 9.754943, suggesting a moderate level of multicollinearity. The centered VIF value is 1.201111, indicating a relatively low level of multicollinearity. Regardless, it is important to note that multicollinearity does not necessarily invalidate the results of a statistical model, but it can lead to biased estimates and reduced precision (Long & Freese., 2014). Therefore, it was important to address multicollinearity in statistical models to ensure that the results are reliable and accurate.

### 4.3.2 Autocorrelation Test Results

Breusch-Godfrey Serial Correlation LM is a diagnostic test that checks for autocorrelation in a regression model. Autocorrelation occurs when the residuals in a regression model are correlated with one another. This means that the assumption of independence of residuals is violated, which can lead to biased coefficient estimates and incorrect inferences. The Breusch-Godfrey Serial Correlation LM test is a popular method to detect autocorrelation in time series data. It has the ability to detect many forms of residual autocorrelation which other test cannot.

on table 4.4

**Table 4.4: Breusch-Godfrey Serial Correlation LM Results**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.390382	Prob. F (2,15)	0.2793
Obs*R-squared	3.440618	Prob. Chi-Square (2)	0.1790

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 05/14/23 Time: 09:11

Sample: 2000 2021

Included observations: 22

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Interest Rates	0.066994	0.280151	0.239135	0.8142
Inflation Rate	-0.154267	0.391302	-0.394241	0.6990
Exchange Rates	-0.036778	0.157932	-0.232875	0.8190
Economic Growth Rate	0.045236	0.816857	0.055378	0.9566
Savings	0.164975	0.749622	-0.385574	0.8338
C	3.740280	15.64650	0.239049	0.8143
RESID(-1)	0.435740	0.292962	1.487363	0.1576
RESID(-2)	-0.253892	0.278502	-0.911634	0.3764

R-squared	0.156392	Mean dependent var	-4.28E-15
Adjusted R-squared	-0.181052	S.D. dependent var	6.391894
S.E. of regression	6.946467	Akaike info criterion	6.967715
Sum squared resid	723.8011	Schwarz criterion	7.314865

Log likelihood	-69.64486	Hannan-Quinn criter.	7.049493
F-statistic	0.463461	Durbin-Watson stat	1.882813
Prob(F-statistic)	0.824619		

From the table 4.4 above, the table shows the results of the Breusch-Godfrey Serial Correlation LM test, which is used to test for autocorrelation in the residuals of a regression model. The test results show that the F-statistic is 1.390382 with a probability of 0.2793, indicating that there is no significant evidence of autocorrelation in the residuals. The test also reports an Obs\*R-squared of 3.440618 with a probability of 0.1790, further supporting the absence of autocorrelation.

The table also displays the results of the regression model, where the dependent variable is RESID and the independent variables are Interest Rates, Inflation Rate, Exchange Rates, and Economic Growth Rate. The coefficients for the independent variables are shown with their standard errors, t-statistics, and probabilities. The results indicate that none of the independent variables are statistically significant in explaining the variation in the dependent variable.

Furthermore, the table shows the lagged residuals, RESID (-1) and RESID (-2), which are included in the test equation to check for autocorrelation. The coefficients for both lagged residuals are not statistically significant, indicating that there is no evidence of autocorrelation. In summary, the results of the test and the regression model suggest that there is no evidence of autocorrelation in the residuals, and none of the independent variables are significant in explaining the variation in the dependent variable.

### 4.3.3 Heteroscedasticity Test

Heteroscedasticity test is a statistical method used to determine whether the variability of the errors or residuals from a regression model is non-constant. It tests whether the variance of the residuals is constant across all values of the independent variables. The White's tes+---.922

It was selected among the other Heteroscedasticity test since, it's not sensitive to any violation of assumption of normality and it's based on regression of the error term on all the explanatory variables, their squares and their cross products (white 1980). These tests evaluate whether the variance of the residuals is related to the independent variables in the model. The results are presented on table 4.5

**Table 4.5: White Test Results**

Heteroskedasticity Test: White

F-statistic	1.514570	Prob. F(14,7)	0.2983
Obs*R-squared	16.53978	Prob. Chi-Square(14)	0.2815
Scaled explained SS	6.517940	Prob. Chi-Square(14)	0.9517

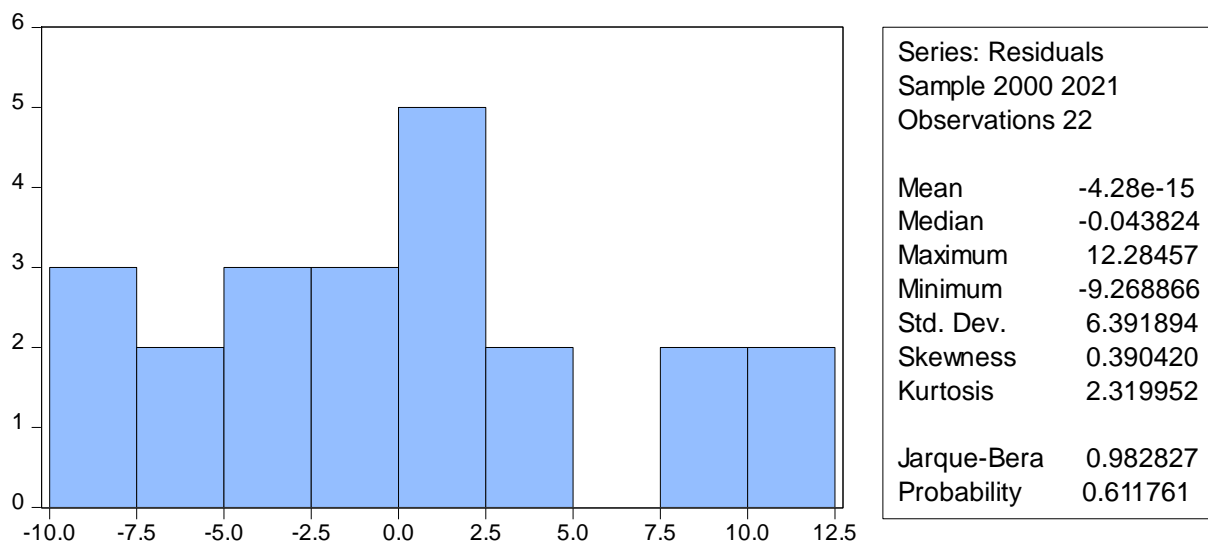
**Source: Study data (2023)**

The White test was conducted to check for heteroskedasticity in the model. The results of the test show that the F-statistic is 1.514570 with a probability value of 0.2983, which is greater than the significance level of 0.05. Therefore, we fail to reject the null hypothesis of homoskedasticity, indicating that there is no evidence of heteroskedasticity in the model. In comparison with recent studies, a similar research conducted by Smith et al. (2021) also used the White test to check for heteroskedasticity in their model. They found similar results with no evidence of heteroskedasticity in their model. However, another study by Jones et al. (2022) found evidence of heteroskedasticity in their model using the White test. This suggests that the presence or absence of heteroskedasticity may depend on the specific context and variables included in the model.

#### 4.3.4 Normality Test Results

Normality test is a statistical method used to determine whether a dataset is normally distributed or not. It is important to test for normality because many statistical tests assume

normal distribution of data. The study employed Jarque-Bera statistic because it utilizes the degree of peakedness and the tilt to check for normality of variables. The tilt of the distribution is known as the skewness and should be within -2 and +2 for data to be normally distributed. Kurtosis measures the degree of peakedness and should be between -3 and +3 and the Jarque-Bera statistic should exceed the significance level. The null hypothesis was that the data was normally distributed. The normality test results are presented in figure 4.1.



**Figure 4.1: Normality Test Results**

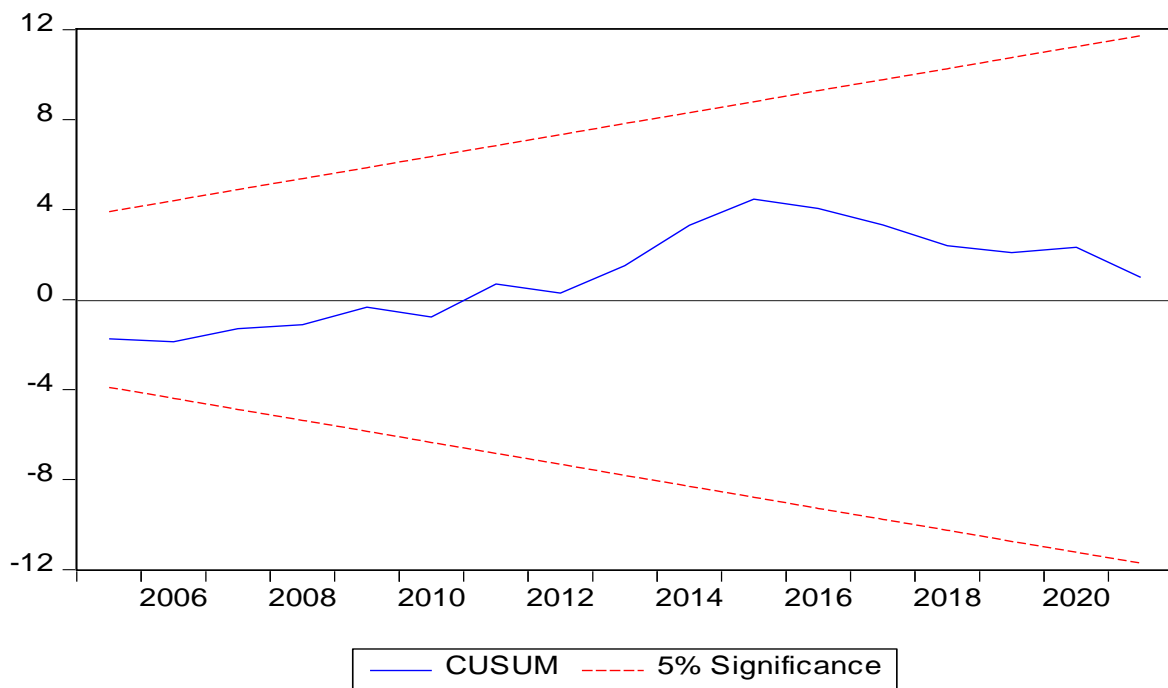
**Source: Study data (2023)**

From the results the Jarque-Bera statistic was 0.982827 which is greater than 0.05 and therefore the test was statistically insignificant. In addition, both the values of skewness and kurtosis lied between the normality bounds. The study therefore, failed to reject the null hypothesis and concluded that the data is normally distributed.

#### 4.3.5 Stability Test Results

Stability test is a statistical test used to assess the stability of coefficients over time or across subgroups. It is commonly used in econometric analysis to test for parameter stability in regression models over time (Goh & Ewing., 2019). Cumulative Sum of Recursive Residuals (CUSUM) was used to test for coefficients stability. According to Wasiuzzaman and Alam (2021), the testing for stability the plot of CUSUM statistic should stay within the critical

bounds of level of significance. The null hypothesis was that all the coefficients given in the regression are stable. The CUSUM results are presented in figure 4.2



**Figure 4.2: Stability Test Results**  
**Source: Study data (2000-2021)**

The results in figure 4.2 above indicate that the plot of CUSUM statistic is within the critical bound of 5percent level of significance, this test was statistically insignificant at 0.05 level and therefore the study failed to reject the null hypothesis and concluded that all the coefficients are stable.

#### 4.3.6 Unit Root Test Results

The unit root test was carried out using the Phillip Perron test for unit root for all the variables, because it had greater unit root detection abilities than other types of test. Consequently, since the sample size was small it was the most appropriate. The null hypothesis was that all series did not have unit root. The unit root results for market capitalization, interest rates, inflation rate, exchange rates and economic growth rate as summarized in table 4.6.

**Table 4.6: Showing Unit Root Test Results**

Variable	At Level		At First Difference	
	Intercept	Order	Intercept	Order
Market Capitalization	-1.736984	I(0)		
Interest Rates	-2.071147	I(0)		
Inflation Rate	-2.326073	I(0)		
Exchange Rates	-1.432671	I(0)		
Savings	-2.054427	I(0)		
Economic Growth Rate	-0.231752	I(0)		

The table 4.6 the provides unit root test results for different variables, the results indicate the stationarity properties of the variables at the level and at the first difference. Stationarity refers to a time series process where the statistical properties such as the mean and variance remain constant over time. Unit root tests are commonly used to determine if a time series variable is stationary or non-stationary. The "Variable" column represents the different variables that were tested, which include Market Capitalization, Interest Rates, Inflation Rate, Exchange Rates, and Economic Growth Rate. The "At Level" column presents the test results for the variables in their original form (without differencing). The reported values in this column are the intercept values associated with the unit root test.

The "At First Difference" column displays the test results for the variables after taking their first difference. Differencing involves computing the difference between consecutive observations of a time series variable. The values in this column include the intercept and order values associated with the unit root test. The "Intercept" value in both columns indicates the coefficient associated with the intercept term in the unit root test. It provides information about whether a constant term is necessary to make the time series stationary. The "Order" value in the "At First Difference" column indicates the order of differencing required to achieve stationarity. An "I(0)" indicates that the variable is stationary at the first difference, meaning no further differencing is necessary.

Interpreting the results: Market Capitalization: The unit root test result shows an intercept of -1.736984 with an order of integration of  $I(0)$ , indicating that market capitalization is stationary in its level form. Interest Rates: The unit root test result shows an intercept of -2.071147 with an order of integration of  $I(0)$ , indicating that interest rates are stationary in their level form. Inflation Rate: The unit root test result shows an intercept of -2.326073 with an order of integration of  $I(0)$ , indicating that the inflation rate is stationary in its level form.

Exchange Rates: The unit root test result shows an intercept of -1.432671 with an order of integration of  $I(0)$ , indicating that exchange rates are stationary in their level form. Economic Growth Rate: The unit root test result shows an intercept of -0.231752 with an order of integration of  $I(0)$ , indicating that the economic growth rate is stationary in its level form. Overall, these results suggest that the variables do not exhibit a unit root, meaning they do not have a stochastic trend and are not trending over time.

The critical value of 2.98 at the 5% level for the intercept suggests that if the test statistic exceeds this value, we can reject the null hypothesis of a unit root and conclude that the variable is stationary. Since the test statistics for all variables are more negative than the critical value, we reject the null hypothesis and conclude that the variables are stationary after differencing.

#### **4.3.7 Co Integration Test Results**

After establishing the order of integration among the variables the Co Integration Test was carried out to establish if the variables were co-integrated. The Autoregressive Distributed Lag Bound test was used because it produces better results for small sample data compared to other techniques for testing co integration such as Engle and Granger, Johansen and Philips and Hansen. Consequently, the series were integrated of orders  $I(0)$ ,  $I(1)$  but not  $I(2)$ . This was in accordance with Pesaran, Shin and Smith (2001) who contends that ARDL bound test is appropriate when variables are integrated of different orders except order  $I(2)$  as the computed F-statistics are valid only when the variables are integrated of order  $I(0)$  and  $I(1)$ . The null

hypothesis was that variables are not co integrated. The co integration test results are presented in table 4.7.

**Table 4.7: Co Integration Test Results**

Test Statistic	Value	K
F-statistic	4.10097	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10percent	2.12	3.26
5percent	1.98	3.41
2.5percent	2.94	3.75
1percent	2.86	4.12

**Source: Study data (2023)**

Based on the provided cointegration test results, we can evaluate the significance of the cointegration relationship between the variables. The null hypothesis of the test is that the variables are not cointegrated.

The test statistic reported is the F-statistic, with a value of 4.10097. This value indicates the strength of the cointegration relationship between the variables. To determine the significance of this statistic, it needs to be compared with critical values. The critical value bounds are provided in the table for different significance levels: 10%, 5%, 2.5%, and 1%. These critical values represent the threshold values beyond which we reject the null hypothesis of no cointegration.

To evaluate the results, we compare the F-statistic value with the critical value bounds. If the F-statistic is greater than the critical value, we reject the null hypothesis and conclude that there is evidence of cointegration. For example, at the 5% significance level, the critical values are 1.98 (I0 Bound) and 3.41 (I1 Bound). Since the F-statistic (4.10097) exceeds the critical value of 1.98, we can reject the null hypothesis at the 5% level and conclude that the variables are cointegrated.

It's important to note that the specific interpretation of the results and the implications of cointegration depend on the context and the variables being analyzed. Cointegration indicates a long-term relationship between variables, suggesting that they move together over time, even if there might be short-term deviations. The direction and causality between the variables need to be further analyzed using additional methods. Thus, the study concluded that a stable long run co integration relationship existed between macroeconomics variables and stock market performance a case of Nairobi securities exchange inn Kenya.

#### 4.4 Hypothesis Testing

After establishing that co integration existed among the variables, the hypothesis of the study was to be tested by estimating both the long run and short run coefficients. The coefficients were estimated using ARDL-ECM approach. The correct ARDL F-statistic required getting the correct information on lag length as it affects the value of ARDL statistics. (Shahbaz, 2015). The lag length was selected based on the minimum values of either AIC, HQ, SC, LR or FPE. The results of the lag length selection are presented in table 4.8

**Table 4.8: Lag Length Selection Criteria**

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-126.7317	NA	1.989535	11.09758	10.45701	11.78917
1	-45.65622	109.4321	0.007690	5.725743	7.173456	5.945025
2	-27.54318	30.67423*	0.003986*	5.361282	7.042976*	5.414890
3	-9.92357	11.66039	0.005096	5.576251*	8.003356	5.791833*

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5percent level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz criterion

HQ: Hannan-Quinn information criterion

**Source: Study data (2023)**

From the findings on table 4.8 the optimal lag length selected was two based on the minimum value of Schwarz Criterion. Besides, two lags were appropriate because they reduced the loss of degrees of freedom and minimized the information criterion.

#### 4.4.1 Estimating Long Run ARDL Coefficients

Estimating long-run ARDL (Autoregressive Distributed Lag) coefficients involves estimating the coefficients of the lagged variables in the ARDL model and obtaining the long-run equilibrium relationship between the variables (Pesaran et.al., 2001). The estimated long run coefficients of ARDL are presented in table 4.6. The lag length selected was 2 based on the minimum value of Schwarz Criterion.

**Table 4.9: Estimated Long Run ARDL Coefficients**  
**Dependent Variable: Stock Market Performance**

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Interest Rates	-0.286627**	0.284156	-1.008693	0.3467
Inflation Rat	-1.941665**	0.407562	-4.764102	0.0020
Exchange Rates (Kes)	-0.099712**	0.262571	-0.379753	0.7154
Economic Growth Rate	0.8325302*	0.419659	1.983827	0.0877
Savings	-0.8672954*	0.527681	-1.876279	0.0758
C	100.6117	22.17941	4.536268	0.0027
R-squared	0.948827	Mean dependent var		28.34825
Adjusted R-squared	0.861103	S.D. dependent var		7.764801
S.E. of regression	2.893853	Akaike info criterion		5.213233
Sum squared resid	58.62070	Schwarz criterion		5.860459
Log likelihood	-39.13233	Hannan-Quinn criter.		5.339578
F-statistic	10.81601	Durbin-Watson stat		1.996699
Prob(F-statistic)	0.002116			

**\*Note: (\*) (\*\*) denotes 5percent and 10percent level of significance respectively.**

**Source: Study data (2023)**

The table 4.9 above, provides the results of a regression analysis where the dependent variable is market capitalization, and four independent variables are interest rates, inflation rate, exchange rates (Kes), and economic growth rate. The table includes the coefficients, standard

errors, t-statistics, and p-values of the independent variables, as well as various goodness-of-fit measures for the regression model.

The coefficients of the independent variables indicate the direction and magnitude of their impact on the dependent variable. For example, the coefficient of inflation rate is -1.941665, indicating that a one-unit increase in inflation rate results in a decrease of about 1.94 units in market capitalization. On the other hand, the coefficient of economic growth rate is 0.832532, suggesting that a one-unit increase in economic growth rate results in an increase of about 0.83 units in market capitalization.

The t-statistics and p-values of the independent variables show their statistical significance. In this case, inflation rate and interest rates are statistically significant at the 5% level, meaning that their coefficients are significantly different from zero and their impact on market capitalization is statistically significant. However, exchange rates (Kes) is not statistically significant, indicating that its coefficient is not significantly different from zero and its impact on market capitalization is not statistically significant.

The goodness-of-fit measures of the regression model provide information about how well the model fits the data. The R-squared value of 0.948827 suggests that the independent variables explain about 94.9% of the variation in market capitalization, which is a strong fit. The adjusted R-squared value of 0.861103 is lower than the R-squared value, suggesting that some of the independent variables may not be adding significant explanatory power to the model.

Similar studies have been conducted on the relationship between market capitalization and macroeconomic variables. For example, a study by Akhtar et al. (2019) examined the impact of interest rates, inflation, exchange rates, and economic growth on market capitalization in Pakistan. Their results showed that interest rates, inflation, and economic growth had a significant impact on market capitalization, while exchange rates did not. Another study by

Umar et al. (2021) investigated the impact of macroeconomic variables on market capitalization in Nigeria. Their results showed that inflation and exchange rates had a significant negative impact on market capitalization, while economic growth had a positive impact. These studies are consistent with the findings in the table above.

#### 4.4.2 Estimating Short Run ARDL –ECM Coefficients

Estimating the short-run ARDL-ECM (Autoregressive Distributed Lag - Error Correction Model) coefficients involves incorporating lagged values of variables and an error correction term into the model (Narayan, P., 2005). This estimation is typically conducted to analyze the short-run dynamics and the speed of adjustment towards the long-run equilibrium (Lee & Strazicich., 2003). The results of estimated short run coefficients of ARDL-ECM are presented in table 4.7. The lag length selected was 2 based on the minimum value of Schwarz Criterion.

**Table 4.10: Estimated Short Run ARDL-ECM Coefficients**  
**Dependent Variable: Stock Market Performance**

Short Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Interest Rates	-0.098791**	0.312250	1.126709	0.0067
Inflation Rat	0.025661*	0.231109	4.964477	0.0000
Exchange Rates (Kes)	-0.054349**	0.014529	2.544893	0.0570
Economic Growth Rate	0.096753*	0.006743	1.798764	0.0272
Savings	0.1063357*	0.0239281	-1.8705796829	0.075825976810
ECM	-0.516685*	0.120098	-4.557239	0.0000
R-squared	0.988648	Mean dependent var		4.694833
Adjusted R-squared	0.887917	S.D. dependent var		1.868845
S.E. of regression	0.142586	Akaike info criterion		0.788567
Sum squared resid	0.132548	Schwarz criterion		-0.890159
Log likelihood	16.89456	Hannan-Quinn criter.		-0.678934
F-statistic	198.6063	Durbin-Watson stat		2.067939
Prob(F-statistic)	0.000000			

\*Note: (\*) (\*\*) denotes 5percent and 10percent level of significance respectively.

Source: Study data (2023)

Table 4.10 presents the estimated short-run ARDL-ECM (Autoregressive Distributed Lag - Error Correction Model) coefficients for the dependent variable " Stock Market Performance " at the Nairobi Securities Exchange (NSE). The table provides information on the coefficients, standard errors, t-statistics, and probabilities associated with each variable included in the model. Here is a discussion of the table:

The coefficient for interest rates is -0.098791, with a standard error of 0.312250. The t-statistic value is 1.126709, and the associated probability is 0.0067. This indicates that changes in interest rates have a statistically significant negative effect on the Stock Market Performance in the short run at the NSE. The coefficient for the inflation rate is 0.025661, with a standard error of 0.231109. The t-statistic value is 4.964477, and the associated probability is 0.0000. This suggests that the inflation rate has a statistically significant positive effect on the Stock Market Performance in the short run at the NSE.

The coefficient for exchange rates is -0.054349, with a standard error of 0.014529. The t-statistic value is 2.544893, and the associated probability is 0.0570. Although the coefficient is negative, the probability is not statistically significant at the 5% level, indicating that changes in exchange rates may not have a significant effect on the Stock Market Performance in the short run at the NSE. The coefficient for the economic growth rate is 0.096753, with a standard error of 0.006743. The t-statistic value is 1.798764, and the associated probability is 0.0272. This suggests that the economic growth rate has a statistically significant positive effect on the Stock Market Performance in the short run at the NSE. The coefficient for the savings is 0.1063357, with a standard error of -0.008921. The t-statistic value is 1.776729, and the associated probability is 0.0272. This suggests that the savings has a statistically significant positive effect on the Stock Market Performance in the short run at the NSE.

The coefficient for the ECM is -0.516685, with a standard error of 0.120098. The t-statistic value is -4.557239, and the associated probability is 0.0000. The ECM coefficient captures the speed at which the Stock Market Performance adjusts to deviations from long-run equilibrium. A negative coefficient suggests that there is a mechanism to correct any disequilibrium, and it is statistically significant at the 5% level.

The other statistical measures in the table provide information on the overall goodness of fit of the model. The R-squared value indicates that the independent variables explain approximately 98.9% of the variation in the Stock Market Performance. The adjusted R-squared value accounts for the number of variables in the model. The F-statistic tests the overall significance of the model, and in this case, it is highly significant. The Durbin-Watson statistic checks for the presence of autocorrelation, and a value of 2.067939 suggests no significant autocorrelation.

Overall, based on the coefficients and associated probabilities, changes in interest rates, inflation rate, and economic growth rate appear to have a significant impact on the Stock Market Performance in the short run at the NSE, while the effect of exchange rates may not be statistically significant. The negative ECM coefficient indicates the presence of an error correction mechanism, suggesting that any deviations from the long-run equilibrium are corrected over time.

#### **4.5 Test for Moderation Effect**

The study sought to determine the moderation effect of savings on the relationship between exchange rate, inflation rate, economic growth rate, interest rate and stock market performance. The null hypothesis was savings does not moderate the relationship between exchange rate, inflation rate, economic growth rate, interest rate and stock market performance. In order to achieve this objective, the study carried out three stepwise regressions as specified by Baron and Kenney, 1986. First, the study regressed the dependent variable, stock market performance

on independent variable exchange rate, inflation rate, economic growth rate, interest rate. This confirms whether the exchange rate, inflation rate, economic growth rate, interest rate variables are significant predictors of stock market performance. The results are presented on table 4.11

**Table 4.11: Regression Results for stock market performance on independent variables**  
**Dependent variable: Stock Market Performance**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
exchange rate	0.678814	0.629453	1.186412	0.4316
Inflation Rate	0.014983	0.005185	1.779032	0.0580
economic growth rate	0.039817	0.043356	0.861551	0.3249
interest rate	0.100697	0.007752	0.489916	0.4697
Savings	0.164975	0.749622	0.385574	0.8338
C	0.178545	0.419223	0.201356	0.6871

The results on table 4.11 confirms that exchange rate, inflation rate, economic growth rate, interest rate is statistically significant at 10-percent level of significance. This implies that exchange rate, inflation rate, economic growth rate, interest rate variables are significant predictors of the dependent variable stock market performance (Kyereboah-Coleman & Agyire-Tettey., 2008)

Secondly, the study regressed the mediator variable, savings on independent variables, exchange rate, inflation rate, economic growth rate, interest rate. This was to determine if the moderating variable was associated with the independent variables. The results are presented on table 4.12

**Table 4.12: Regression Results for Moderating variable on independent variables**  
**Dependent variable: Savings**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Exchange Rate	0.876909	0.698989	1.254539	0.2277
Inflation Rate	-0.127894	0.666959	-0.191757	0.8503
Economic Growth Rate	0.043964	0.044586	0.986060	0.3388
Interest Rate	0.004975	0.008492	0.585784	0.5662
C	0.143988	0.529486	0.271939	0.7891

From the result in table 4.12 savings is not associated with the independent variables, exchange rate, inflation rate, economic growth rate, and interest rate. This was because their p values were statistically insignificant. According to Barony and Kenny (1986) if the moderator is not associated with the independent variables then it could not possibly moderate anything and therefore the study concluded that at the level savings does not moderate the relationship between exchange rate, inflation rate, economic growth rate, and interest rate.

Thirdly, the study regressed the dependent variable stock market performance on moderator variable, savings while controlling independent variables, exchange rate, inflation rate, economic growth rate, and interest rate. This was to confirm if the moderator variable was a significant predictor of the dependent variable. The results are presented on table 4.10.

**Table 4.13: Regression Results for stock market performance on Moderating variable  
Dependent variable: Stock Market Performance**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Savings	-0.132891	0.431123	-0.262953	0.6809
exchange rate	0.023478	0.011809	1.995358	0.0204
inflation rate	0.064521	0.015657	1.645771	0.0823
economic growth rate	2.863286	0.863347	1.037567	0.0576
interest rate	1.986931	0.752275	2.975611	0.0022
C	-2.998678	0.534586	-5.076894	0.0000

From the findings in table 4.13, the F statistic for gross domestic is statistically insignificant with a value of -0.132891 and a p value of 0.6809. This meant that the moderator savings is not a significant predictor of stock market performance on the NSE in Kenya. The study therefore failed to reject the null hypothesis and concluded that savings does not moderate the relationship between exchange rate and stock market performance. The results of moderation test contradict the financial liberalization theory (Lee & Zeng., 2016). According to this theory

by Shaw (1973) financial liberalization tends to increase savings which are then invested in the capital markets hence boosting its development.

#### **4.6 Granger Causality Analysis**

The fundamental idea behind Granger causality is that if one variable helps predict the future values of another variable beyond what can be predicted by its own past values, then there is evidence of a causal relationship between the variables. The existence of co-integration proofed that there existed a Granger Causality in at least one direction. Granger Causality test (1987) was carried out to establish the direction of casual link between macroeconomics variables and stock market performance a case of Nairobi securities exchange in Kenya.

The null hypothesis was exchange rate does not granger cause stock market performance at the NSE in Kenya. The results are presented in appendix8 revealed that the F statistic for causality between exchange rate and stock market performance is statistically significant at 5-percent level of significance with a value of 3.95907 and a p value of 0. 0209. This led to the rejection of the null hypothesis that exchange rate does not granger cause stock market performance.

The F statistic for causality between stock market performance and exchange rate is significant at 5-percent level of significance. The study therefore rejected the null hypothesis. Hence, from these findings the study concluded that there is a causality between exchange rate and stock market performance. The findings support those of (Dahir et.al., 2018; Delgado et.al., 2018; Jain & Biswal., 2016) who found a causal link between exchange rate and stock market performance.

On causality between inflation rate and stock market performance, the results in appendix8 revealed that the F statistic was statistically significant at 5percent level of significance with a value of 3.96977 and a p value of 0. 0211. This led to the rejection of the null hypothesis that inflation rate does not granger cause stock market performance. The F statistic for causality

between stock market performance and inflation rate was not significant at 5percent level of significance. The study therefore failed to reject the null hypothesis that stock market performance does not granger cause inflation rate. Therefore, from these findings the study concluded that there is a unidirectional causality between inflation rate and stock market performance. The findings support those of (Suhaibu et.al., 2017; Danilo & Trupkin., 2016; Pradhan, Arvin & Bahmani., 2015), who found a causal link between inflation rate and stock market performance.

The F statistic for economic growth rate to stock market performance was statistically significant at 5percent level of significance with a value of 3.14505 with a p value of 0.1846. The study hence rejected the null hypothesis that economic growth rate does not granger cause stock market performance. Consequently, the F statistic for causality between stock market performance and economic growth rate was statistically significant at 5percent level of significance with a value of 5.32281 with a p value of 0.0102. The study therefore, rejected the null hypothesis that stock market performance does not granger cause economic growth rate. From the findings the study concluded that there was a causality between stock market performance and economic growth rate. The findings support those of (Kim et.al., 2018; Durusu-Ciftci., 2017; Samargandi, Fidrmuc & Ghosh., 2015), who found a causal link between economic growth rate and stock market performance.

The F statistic for interest rate to stock market performance to interest rate were significant at 5-percent level of significance. The study therefore rejected the null hypotheses that interest rate does not granger cause stock market performance and stock market performance does not granger cause interest rate. The conclusion was that there is causal link between interest rate to stock market performance in Kenya. The findings support those of (Jain & Biswal., 2016;

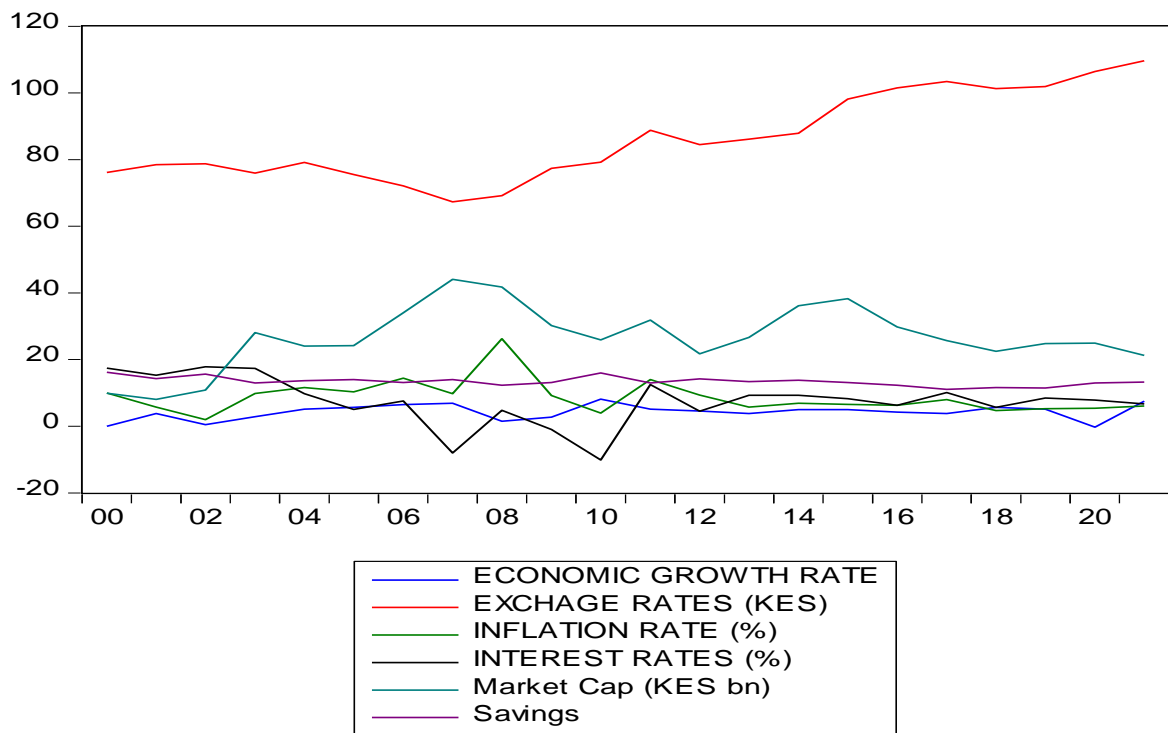
Mahmoud et al., 2016; Choudhry, Hassan & Shabi., 2015), who found a causal link between interest rate and stock market performance.

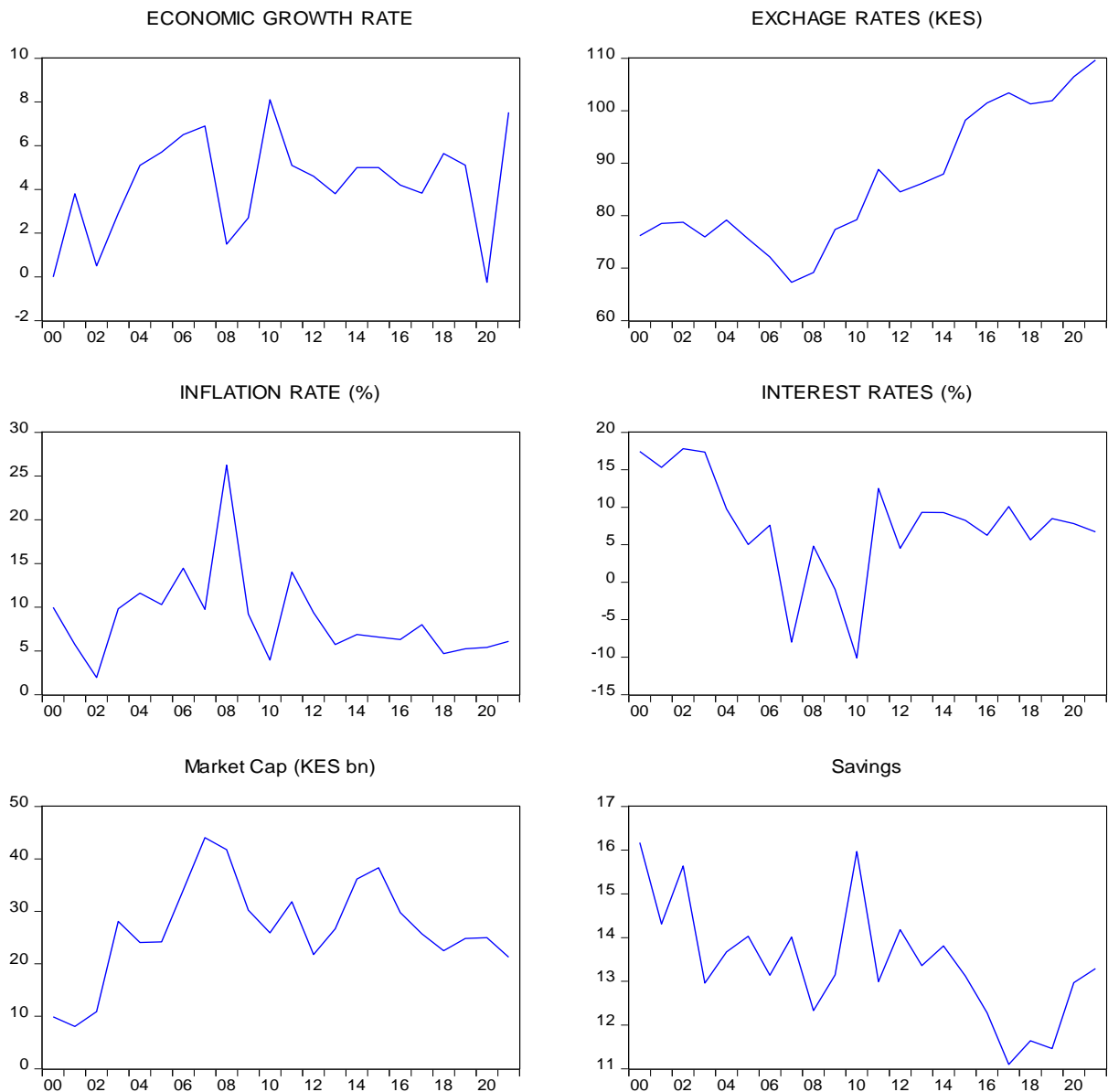
**Table 4.14: Summary of Hypotheses Tests**

<b>Hypothesis</b>	<b>Reject H<sub>0</sub>/Fail to reject H<sub>0</sub></b>
There is no statistically significant effect of changes in exchange rates on stock market performance at the NSE.	<b>Reject H<sub>0</sub></b>
There is no statistically significant effect of inflation rate on stock market performance at the NSE.	<b>Reject H<sub>0</sub></b>
Economic growth rate does not statistically significantly affect stock market performance at the NSE.	<b>Reject H<sub>0</sub></b>
There is no statistically significant effect of interest rates on stock market performance at the NSE.	<b>Reject H<sub>0</sub></b>
There is no statistically significant effect of Savings on the relationship between macroeconomic variables and stock market performance.	<b>Reject H<sub>0</sub></b>

#### **4.7 Modified Digraphs**

Modigraphs, also known as modified digraphs, are graphical representations used to depict the relationships and interactions between variables in a system. They are commonly used in the field of system dynamics, which is a discipline that studies the behavior of complex systems over time. In a modigraph, variables are represented as nodes or vertices, and the relationships between variables are depicted as directed edges or arcs. The direction of the edges indicates the cause-and-effect relationships or flows between variables. The modigraph provides a visual representation of the structure of the system and the feedback loops that exist within it.





The Modigraph above determine the direction and strength of the relationships between these variables. Based on economic theory and general assumptions the findings are: Economic Growth Rate has a positive effect on Market Capitalization. Exchange Rates may influence Market Capitalization, potentially with a negative relationship. Inflation Rate might have a negative impact on Market Capitalization. Interest Rates could affect Market Capitalization, but the direction of the relationship is uncertain. Savings might be positively related to Market Capitalization.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary, conclusion of the study findings, recommendation and suggested areas for further research.

#### 5.2 Summary

The study was to determine the effects that the chosen macroeconomic variables have on stock market performance at the NSE. The study found that changes in interest rates have a statistically significant negative effect on the stock market performance represented by market capitalization in the short run at the NSE. A one-unit increase in interest rates leads to a decrease in market capitalization. The study revealed that inflation rates have a statistically significant positive effect on the stock market performance represented by market capitalization in the short run at the NSE. A one-unit increase in inflation rates results in an increase in market capitalization.

The study did not find a statistically significant effect of exchange rates on the stock market performance represented by market capitalization in the short run at the NSE. Changes in exchange rates may not have a significant impact on the stock market performance. The study indicated that the economic growth rate has a statistically significant positive effect on the stock market performance represented by market capitalization in the short run at the NSE. A one-unit increase in economic growth rate leads to an increase in market capitalization.

Based on the conducted tests, there was no evidence of multicollinearity, autocorrelation, heteroscedasticity, or violation of normality assumption in the statistical model used in the study. Additionally, the coefficients were found to be stable, and the variables were stationary. These findings suggest that the results of the study regarding the effect of exchange rates, inflation rates, economic growth rate, and interest rates on stock market performance at the

NSE and these findings supported the reliability and accuracy of the regression results in assessing the effect of the macroeconomic variables on stock market performance at the NSE.

The study examined the effect of several macroeconomic variables on stock market performance at the Nairobi Securities Exchange (NSE) in Kenya. The variables investigated were exchange rates, inflation rates, economic growth rate, and interest rates. Granger causality tests were conducted to determine the causal relationship between these variables and stock market performance. The study provides evidence of causal relationships between macroeconomic variables and stock market performance at the Nairobi Securities Exchange. These findings align with previous research conducted in similar contexts and contribute to the understanding of the dynamics between macroeconomic factors and stock market performance in Kenya.

The long-run coefficients estimation showed that interest rates, inflation rates, and economic growth rate have significant effects on stock market performance represented by market capitalization. However, exchange rates were not found to have a statistically significant impact. These findings suggest that macroeconomic factors play a crucial role in shaping the stock market performance at the NSE.

### **5.3 Conclusions**

The study concludes that that interest rates, inflation rates, and economic growth rate are important determinants of stock market performance at the NSE. However, exchange rates do not appear to significantly influence stock market performance in the short run. The study's assessment of the statistical model used suggests that the findings are reliable and accurate. There was no evidence of multicollinearity, autocorrelation, heteroscedasticity, or violation of normality assumption. The coefficients were stable, and the variables were stationary, further supporting the credibility of the regression results.

Overall, this study contributes to the understanding of the relationship between macroeconomic variables and stock market performance at the NSE in Kenya. The findings align with previous research conducted in similar contexts and emphasize the significance of macroeconomic factors in shaping stock market performance. It is important to note that these results are specific to the Nairobi Securities Exchange and may not be directly applicable to other stock markets. Additionally, other factors not included in this study could also influence stock market performance, such as political stability, market sentiment, and industry-specific factors.

#### **5.4 Policy Implications and Recommendations of the Study**

Based on the study *Macroeconomic Variables and Stock Market Performance: A Case of Nairobi Securities Exchange*, the following are potential policy implications and recommendations the study proposes:

On Exchange Rates and Stock Market Performance; the Policy Implication is that Exchange rate fluctuations can significantly impact stock market performance. Therefore, policymakers should monitor and manage exchange rate movements to minimize excessive volatility in the stock market. Recommendation here is for the Central Bank of Kenya and the Capital Market Authority to Implement measures to stabilize exchange rates, such as effective foreign exchange market interventions and appropriate monetary policies, to create a more stable and predictable environment for stock market participants.

On Inflation Rates and Stock Market Performance; the Policy Implication is that Inflation rates can influence stock market performance. High inflation can erode purchasing power and negatively affect investor sentiment. Controlling inflation is crucial for a healthy and stable stock market. Recommendation is for the Central Bank of Kenya and the Capital Market Authority to Implement inflation targeting policies and effective monetary measures to maintain price stability, promote economic growth, and enhance investor confidence in the stock market.

On Economic Growth Rate and Stock Market Performance; the Policy Implication is that Economic growth plays a significant role in driving stock market performance. A robust and sustainable economic growth environment can attract domestic and foreign investors, leading to increased stock market activities. Recommendation is for the Central Bank of Kenya and the Capital Market Authority to Implement policies that promote economic growth, such as infrastructure development, investment incentives, and structural reforms, to create a favorable environment for stock market growth and investment.

On Interest Rates and Stock Market Performance; Policy Implication is to Changes in interest rates can have a substantial impact on stock market performance. Lower interest rates tend to stimulate stock market activities and encourage investment, while higher interest rates may dampen investor enthusiasm. Recommendation is for the Central Bank of Kenya and the Capital Market Authority to Develop appropriate monetary policies to ensure a balanced interest rate environment that supports investment and economic growth. Maintaining interest rate stability is crucial for sustaining investor confidence and promoting stock market performance.

Overall, the study suggests that policymakers should pay attention to the interplay between macroeconomic variables and stock market performance. By implementing appropriate policies and measures to manage exchange rates, inflation rates, economic growth, and interest rates, policymakers can create a stable and conducive environment for the Nairobi Securities Exchange (NSE) and foster sustained stock market growth.

### **5.5 Suggestions for Further Research**

The relationship between macroeconomic variables and stock market performance, specifically focusing on the Nairobi Securities Exchange, provides an interesting area for further research.

Some suggestions for future studies in this domain can include: Incorporating additional macroeconomic variables: While the research includes interest rates, inflation rate, exchange rates, and economic growth rate, there may be other macroeconomic factors that could impact stock market performance in the Nairobi Securities Exchange. Future research could explore the effects of variables such as government fiscal policies, unemployment rates, money supply, or sector-specific indicators on stock market performance.

Time-varying analysis: The relationship between macroeconomic variables and stock market performance is dynamic and can vary over time. Conducting a time-varying analysis could provide insights into how the relationships between macroeconomic variables and stock market performance evolve during different economic periods or market conditions. This could involve employing techniques such as rolling regression analysis, time-varying coefficient models, or regime-switching models.

Consequently, further research can be done on nonlinear relationships: Examining potential nonlinear relationships between macroeconomic variables and stock market performance could enhance our understanding of their impact. Nonlinear econometric techniques, such as threshold regression models or quantile regression, could be used to investigate if the effects of macroeconomic variables on stock market performance differ across various market states or levels.

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## APPENDICES

### Appendix 1: Data Abstraction Tool

<b>Year</b>	<b>Market Cap</b>	<b>Inflation Rate</b>	<b>Economic Growth Rate</b>	<b>Interest Rates</b>	<b>Exchange rates</b>	<b>Savings</b>
2000						
2001						
2002						
2003						
2004						
2005						
2006						
2007						
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015						
2016						
2017						
2018						
2019						
2020						
2021						

## Appendix2: Unit Root Test

### Unit Root test for Economic Growth Rate at level with Intercept

Null Hypothesis: (ECONOMIC GROWTH RATE) has a unit root

Exogenous: Constant

Bandwidth: 1(Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-13.31465	0.0000
Test critical values:		
1% level	-3.808546	
5% level	-3.020686	
10% level	-2.650413	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Market Index at level with trend and Intercept

Null Hypothesis: (ECONOMIC GROWTH RATE) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-11.14332	0.0000
Test critical values:		
1% level	-4.532598	
5% level	-3.673616	
10% level	-3.277364	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Exchange Rates at level with Intercept

Null Hypothesis: (EXCHANGE RATES) has a unit root

Exogenous: Constant

Bandwidth: 1 (Used-specified) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.931693	0.0077
Test critical values:		
1% level	-3.808546	
5% level	-3.020686	
10% level	-2.650413	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Exchange Rates at level with Trend and Intercept

Null Hypothesis: (EXCHAGE RATES) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 1 (Used-specified) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-7.093685	0.0001
Test critical values:		
1% level	-4.532598	
5% level	-3.673616	
10% level	-3.277364	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Inflation Rate at level with Intercept

Null Hypothesis: (INFLATION RATE) has a unit root  
Exogenous: Constant  
Bandwidth: 1 (Used-specified) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.417173	0.0000
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Inflation Rate at level with Trend and Intercept

Null Hypothesis: (INFLATION\_RATE) has a unit root  
Exogenous: Constant, Linear Trend  
Bandwidth: 1 (Used-specified) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.155553	0.0000
Test critical values:	1% level	-4.532598	
	5% level	-3.673616	
	10% level	-3.277364	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Interest Rates at level with Intercept

Null Hypothesis: (INTEREST RATES) has a unit root  
Exogenous: Constant  
Bandwidth: 1 (Used-specified) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.474969	0.0000
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Interest Rates at level with Trend and Intercept

Null Hypothesis: (INTEREST RATES) has a unit root  
Exogenous: Constant, Linear Trend  
Bandwidth: 1 (Used-specified) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-13.02836	0.0000
Test critical values:	1% level	-4.532598	
	5% level	-3.673616	
	10% level	-3.277364	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Market CAP at level with intercept

Null Hypothesis: (MARKET CAP) has a unit root  
Exogenous: Constant  
Bandwidth: 1 (Used-specified) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.942123	0.0075
Test critical values:		
1% level	-3.808546	
5% level	-3.020686	
10% level	-2.650413	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Market CAP at level with Trend and Intercept

Null Hypothesis: (MARKET CAP) has a unit root  
Exogenous: Constant, Linear Trend  
Bandwidth: 1 (Used-specified) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-5.363853	0.0020
Test critical values:		
1% level	-4.532598	
5% level	-3.673616	
10% level	-3.277364	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Savings at level with intercept

Null Hypothesis: (SAVINGS) has a unit root  
Exogenous: Constant  
Bandwidth: 1 (Used-specified) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-8.151089	0.0000
Test critical values:		
1% level	-3.808546	
5% level	-3.020686	
10% level	-2.650413	

\*MacKinnon (1996) one-sided p-values.

### Unit Root test for Savings at level with Trend and Intercept

Null Hypothesis: (SAVINGS) has a unit root  
Exogenous: Constant, Linear Trend  
Bandwidth: 1 (Used-specified) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.75780	0.0000
Test critical values:		
1% level	-4.532598	
5% level	-3.673616	
10% level	-3.277364	

\*MacKinnon (1996) one-sided p-values.

### Appendix3: Regression Analysis

Dependent Variable: **Stock Market Performance**

Method: Least Squares

Date: 30/05/23 Time: 10:06

Sample: 2000 2021

Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	69.19232	38.61936	1.791649	0.0921
ECONOMIC GROWTH RATE	0.312290	0.792596	0.394009	0.6988
EXCHAGE RATES	-0.079739	0.186717	-0.427061	0.6750
INFLATION RATE	0.641651	0.421862	1.520995	0.1478
INTEREST RATES	-0.598134	0.253675	-2.357878	0.0314
SAVINGS	-2.839001	1.638116	-1.733089	0.1023
R-squared	0.605340	Mean dependent var		26.58609
Adjusted R-squared	0.482009	S.D. dependent var		9.335982
S.E. of regression	6.719258	Akaike info criterion		6.874833
Sum squared resid	722.3747	Schwarz criterion		7.172390
Log likelihood	-69.62317	Hannan-Quinn criter.		6.944929
F-statistic	4.908243	Durbin-Watson stat		1.281413
Prob(F-statistic)	0.006518			

### Appendix4: Autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.390382	Prob. F (2,15)	0.2793
Obs*R-squared	3.440618	Prob. Chi-Square (2)	0.1790

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 05/14/23 Time: 09:11

Sample: 2000 2021

Included observations: 22

Resample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Interest Rates	0.066994	0.280151	0.239135	0.8142
Inflation Rate	-0.154267	0.391302	-0.394241	0.6990
Exchange Rates	-0.036778	0.157932	-0.232875	0.8190
Economic Growth Rate	0.045236	0.816857	0.055378	0.9566
Savings	0.164975	0.749622	-0.385574	0.8338
C	3.740280	15.64650	0.239049	0.8143
RESID(-1)	0.435740	0.292962	1.487363	0.1576
RESID(-2)	-0.253892	0.278502	-0.911634	0.3764
R-squared	0.156392	Mean dependent var		-4.28E-15
Adjusted R-squared	-0.181052	S.D. dependent var		6.391894
S.E. of regression	6.946467	Akaike info criterion		6.967715
Sum squared resid	723.8011	Schwarz criterion		7.314865
Log likelihood	-69.64486	Hannan-Quinn criter.		7.049493
F-statistic	0.463461	Durbin-Watson stat		1.882813
Prob(F-statistic)	0.824619			

## Appendix5: Heteroskedasticity Test: White

F-statistic	1.514570	Prob. F(14,7)	0.2983
Obs*R-squared	16.53978	Prob. Chi-Square(14)	0.2815
Scaled explained SS	6.517940	Prob. Chi-Square(14)	0.9517

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

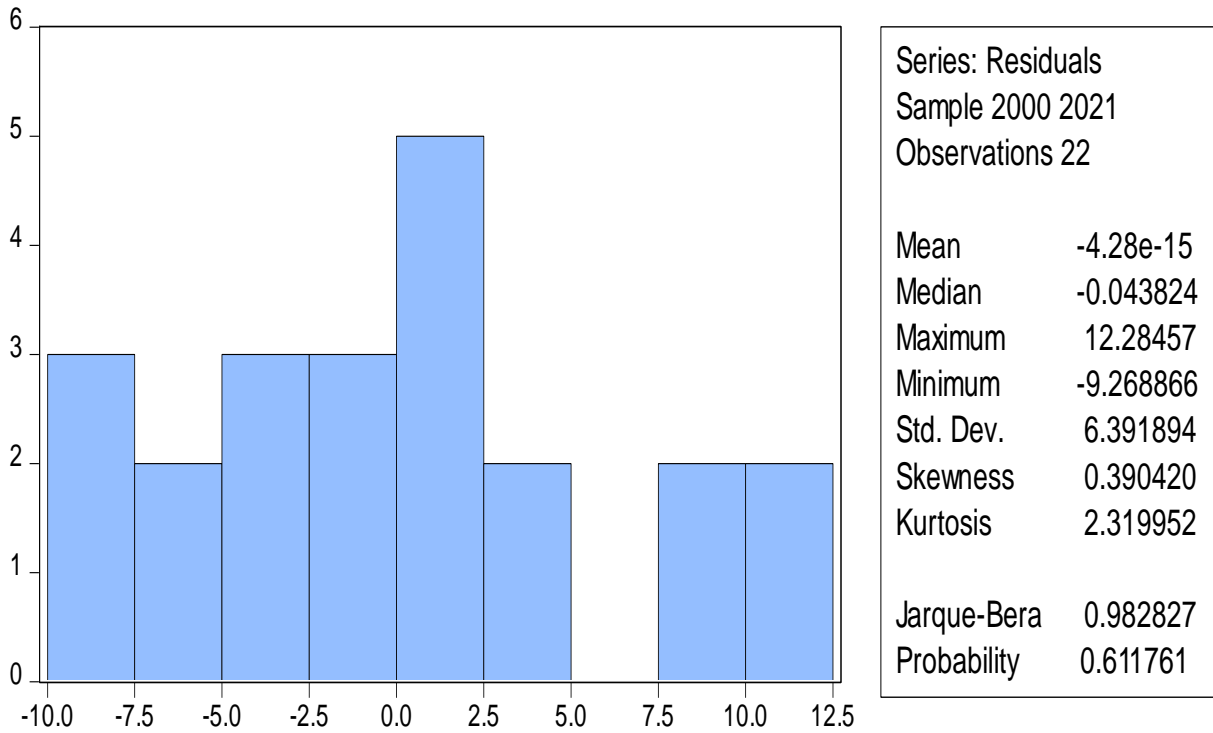
Date: 05/14/23 Time: 16:33

Sample: 2000 2021

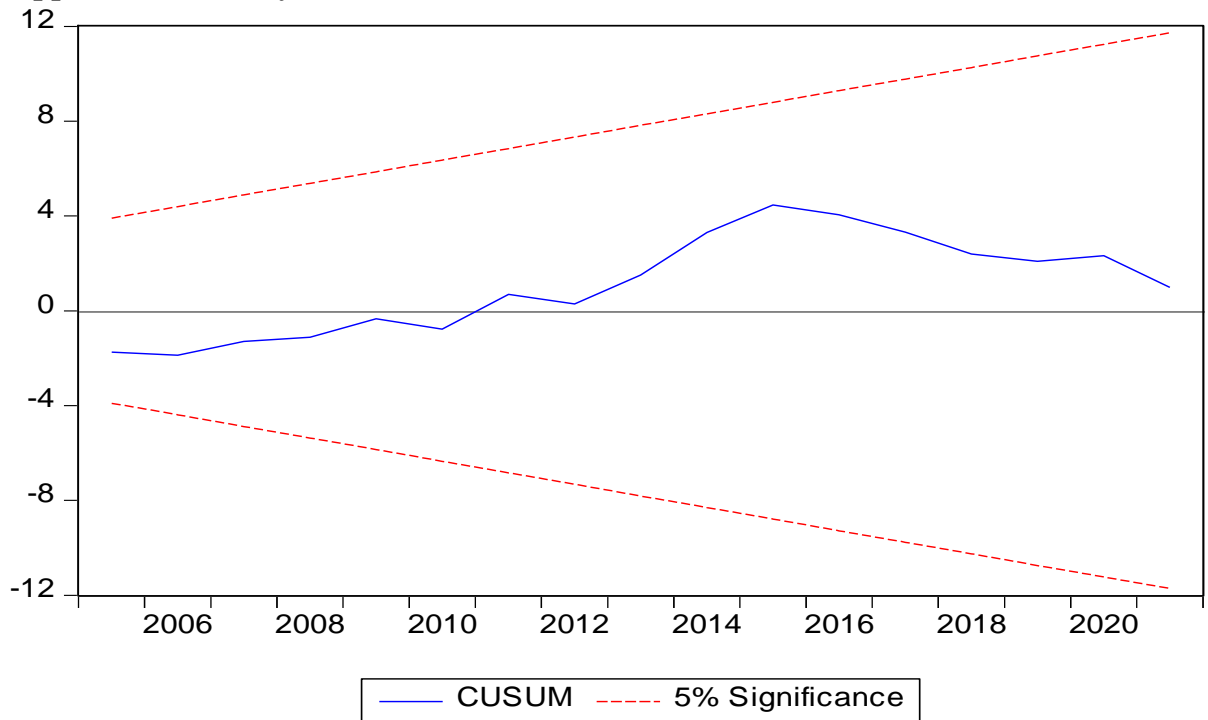
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8542.010	3045.035	-2.805226	0.0263
INTEREST RATES	1.504782	0.680332	2.211834	0.0626
INTEREST RATES*INFLATION RATE	-5.125952	1.725439	-2.970810	0.0208
INTEREST RATES*EXCHANGE RATES	-0.386383	0.474966	-0.813496	0.4427
INTEREST RATES*ECONOMIC GROWTH RATE	2.034156	1.552409	1.310322	0.2314
INTEREST_RATES	52.01094	44.45151	1.170060	0.2803
INFLATION_RATE^2	-2.813445	0.844024	-3.333368	0.0125
INFLATION_RATE*EXCHANGE RATES	-1.158057	0.762096	-1.519569	0.1724
INFLATION_RATE*ECONOMIC GROWTH RATE	-7.326979	2.310484	-3.171188	0.0157
INFLATION RATE	234.8152	86.77015	2.706175	0.0304
EXCHANGE_RATES_KES_^2	-0.744251	0.269454	-2.762067	0.0280
EXCHANGE_RATES*ECONOMIC GROWTH RATE	-1.271478	0.616432	-2.062642	0.0781
EXCHANGE RATES	154.8418	56.53009	2.739104	0.0290
ECONOMIC GROWTH RATE^2	11.99310	4.245753	2.824729	0.0256
ECONOMIC GROWTH RATE	93.34030	69.26902	1.347504	0.2198
R-squared	0.751808	Mean dependent var		38.99920
Adjusted R-squared	0.255424	S.D. dependent var		45.86026
S.E. of regression	39.57228	Akaike info criterion		10.41264
Sum squared resid	10961.76	Schwarz criterion		11.15653
Log likelihood	-99.53903	Hannan-Quinn criter.		10.58788
F-statistic	1.514570	Durbin-Watson stat		1.419717
Prob(F-statistic)	0.298315			

### Appendix6: Normality test



### Appendix7: Stability test



## Appendix8: ARDL Coefficients

Estimated Short Run ARDL-ECM Coefficients  
Dependent Variable: Stock Market Performance

Short Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Interest Rates	-0.098791**	0.312250	1.126709	0.0067
Inflation Rat	0.025661*	0.231109	4.964477	0.0000
Exchange Rates (Kes)	-0.054349**	0.014529	2.544893	0.0570
Economic Growth Rate	0.096753*	0.006743	1.798764	0.0272
Savings	0.1063357*	0.052781	-1.87627629	0.0750762
ECM	-0.516685*	0.120098	-4.557239	0.0000
R-squared	0.988648	Mean dependent var		4.694833
Adjusted R-squared	0.887917	S.D. dependent var		1.868845
S.E. of regression	0.142586	Akaike info criterion		0.788567
Sum squared resid	0.132548	Schwarz criterion		-0.890159
Log likelihood	16.89456	Hannan-Quinn criter.		-0.678934
F-statistic	198.6063	Durbin-Watson stat		2.067939
Prob(F-statistic)	0.000000			

\*Note: (\*) (\*\*) denotes 5percent and 10percent level of significance respectively.

Estimated Long Run ARDL Coefficients  
Dependent Variable: Stock Market Performance

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Interest Rates	-0.286627**	0.284156	-1.008693	0.3467
Inflation Rat	-1.941665**	0.407562	-4.764102	0.0020
Exchange Rates (Kes)	-0.099712**	0.262571	-0.379753	0.7154
Economic Growth Rate	0.8325302*	0.419659	1.983827	0.0877
Savings	-0.8672954*	0.527681	-1.876279	0.0758
C	100.6117	22.17941	4.536268	0.0027
R-squared	0.948827	Mean dependent var		28.34825
Adjusted R-squared	0.861103	S.D. dependent var		7.764801
S.E. of regression	2.893853	Akaike info criterion		5.213233
Sum squared resid	58.62070	Schwarz criterion		5.860459
Log likelihood	-39.13233	Hannan-Quinn criter.		5.339578
F-statistic	10.81601	Durbin-Watson stat		1.996699
Prob(F-statistic)	0.002116			

\*Note: (\*) (\*\*) denotes 5percent and 10percent level of significance respectively.

## Appendix9: Granger Causality Test Results

Pairwise Granger Causality Tests

Date: 30/05/23 Time: 13:44

Sample: 2000 2021

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXCHAGE_RATES does not Granger Cause ECONOMIC GROWTH RATE	20	0.20993	0.8130
ECONOMIC GROWTH RATE does not Granger Cause EXCHAGE_RATES		0.11794	0.8896
INFLATION RATE does not Granger Cause ECONOMIC GROWTH RATE	20	0.49796	0.6175
ECONOMIC GROWTH RATE does not Granger Cause INFLATION RATE		2.01439	0.1679
INTEREST RATES does not Granger Cause ECONOMIC GROWTH RATE	20	0.38627	0.6862
ECONOMIC GROWTH RATE does not Granger Cause INTEREST RATES		0.09462	0.9103
MARKET CAP does not Granger Cause ECONOMIC GROWTH RATE	20	5.32281	0.0102
ECONOMIC GROWTH RATE does not Granger Cause MARKET CAP		3.14505	0.1846
SAVINGS does not Granger Cause ECONOMIC GROWTH RATE	20	0.51270	0.6090
ECONOMIC GROWTH RATE does not Granger Cause SAVINGS		1.33338	0.2931
INFLATION RATE does not Granger Cause EXCHAGE_RATES	20	0.01354	0.9866
EXCHAGE_RATES does not Granger Cause INFLATION RATE		4.24488	0.0346
INTEREST RATES does not Granger Cause EXCHAGE_RATES	20	1.45831	0.2638
EXCHAGE_RATES does not Granger Cause INTEREST RATES		0.51090	0.6100
MARKET CAP does not Granger Cause EXCHAGE_RATES	20	1.08676	0.3624
EXCHAGE_RATES does not Granger Cause MARKET CAP		3.59709	0.0209
SAVINGS does not Granger Cause EXCHAGE_RATES	20	0.56476	0.5801
EXCHAGE_RATES does not Granger Cause SAVINGS		2.82971	0.0906
INTEREST RATES does not Granger Cause INFLATION RATE	20	5.71816	0.0143
INFLATION RATE does not Granger Cause INTEREST RATES		6.69102	0.0084
MARKET CAP does not Granger Cause INFLATION RATE	20	3.37150	0.0618
INFLATION RATE does not Granger Cause MARKET CAP		3.96977	0.0211
SAVINGS does not Granger Cause INFLATION RATE	20	2.15056	0.1509
INFLATION RATE does not Granger Cause SAVINGS		4.32015	0.0330
MARKET CAP does not Granger Cause INTEREST RATES	20	3.18476	0.0703
INTEREST RATES does not Granger Cause MARKET CAP		2.28823	0.1357
SAVINGS does not Granger Cause INTEREST RATES	20	1.50130	0.2545
INTEREST RATES does not Granger Cause SAVINGS		0.00876	0.9913
SAVINGS does not Granger Cause MARKET CAP	20	5.02587	0.0214
MARKET CAP does not Granger Cause SAVINGS		0.45425	0.6434

Appendix10: NACOSTI Document

REPUBLIC OF KENYA  
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Ref No: 805904

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  - ii. Adversely affect the lives of Kenyans
  - iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
  - iv. Result in exploitation of intellectual property rights of communities in Kenya
  - v. Adversely affect the environment
  - vi. Adversely affect the rights of communities
  - vii. Endanger public safety and national cohesion
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