RELATIONSHIP BETWEEN MACROECONOMIC FACTORS AND THE STOCK MARKET DEVELOPMENT IN KENYA

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MASTERS OF SCIENCE IN COMMERCE (FINANCE& INVESTMENT)

KCA UNIVERSITY

2025

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCE IN COMMERCE DEGREE FINANCE AND INVESTMENT, IN THE SCHOOL OF BUSINESS AT KCA UNIVERSITY.

MAY, 2025

DECLARATION

I declare this dissertation is my original work and has not been presented for an award in any other university. I also declare this work has no written or published material by other researchers apart from instances where references are made and the authors are acknowledged entirely.

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ABSTRACT

Stock markets constitute an essential component of modern economic systems, serving as mechanisms for capital allocation, savings mobilization, and the promotion of economic development. They offer corporations a structured avenue to raise capital for expansion, enhance market liquidity, facilitate price discovery, and contribute to both the creation and distribution of wealth. In Kenya, the interplay between macroeconomic indicators and stock market development warrants comprehensive investigation, particularly in light of the growing significance of financial markets in the country's economic architecture. This study sought to examine the relationship between selected macroeconomic variables specifically Gross Domestic Product (GDP) growth, inflation, interest rates, and exchange rates and their influence on the development of the Kenyan stock market. The investigation was anchored in prominent theoretical models such as the Efficient Market Hypothesis (EMH), Arbitrage Pricing Theory (APT), and the Three-Factor Model. These frameworks offered foundational perspectives for interpreting the interactions between economic fundamentals and financial market performance. Using a mixed-methods approach, the study combined quantitative analysis with time series data from 2000 to 2023 on a quarterly basis. The statistical analysis was conducted using STATA 12, employing a multiple linear regression model under the ordinary least squares (OLS) methodology to identify significant relationships among the variables of interest. Primary data sources included financial disclosures from listed firms on the Nairobi Securities Exchange (NSE), macroeconomic data from the Central Bank of Kenya and the Kenya National Bureau of Statistics, as well as exchange rate information obtained from the International Monetary Fund (IMF) and the World Bank. The analytical process commenced with a descriptive statistical assessment, encompassing measures such as the mean, variance, skewness, and kurtosis. Thereafter, diagnostic tests were conducted to ensure the fulfillment of OLS assumptions, including tests for stationarity, multicollinearity, and serial correlation. To capture both short-term dynamics and long-term equilibrium relationships, the study applied advanced econometric techniques, including Vector Error Correction Model (VECM), the Johansen Cointegration Test, and Granger Causality analysis. Furthermore, the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) were utilized to evaluate the dynamic temporal responses of the variables. The findings of the study yielded valuable insights for policymakers, investors, and financial analysts by elucidating the macroeconomic determinants of stock market performance in Kenya. The results also served to inform strategic financial decision-making, enhance risk management frameworks, and support the formulation of sound economic policies. Additionally, this study aimed to contribute to the broader academic discourse on financial market development within the context of emerging economies.

Keywords: Macroeconomic indicators; Gross Domestic Product; Inflation; Interest rates; Exchange rates; Stock market development; Kenya.

ACKNOWLEDGEMENT

I want to thank God for his guidance, peace, and providence, enabling me to write this project. The encouragement of my parents, sisters, daughter, and friends through prayer has helped me throughout this journey.

I also thank my project supervisor for her guidance and insight during the project duration.

DEDICATION

I dedicate this project to the Almighty God, my family, my daughter and my friends who have encouraged and prayed for me throughout the journey.

Thank you.

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ABREVIATIONS AND ACRONYMS

CMA	Capital Markets Authority
EMH	Efficient Market Hypothesis
APT	Arbitrage Pricing Model
GDP	Gross Domestic Product
NSE	Nairobi Securities Exchange
UNCTAD	United Nations Conference on Trade Development
IMF	International Monetary Fund
VAR	Variance Autoregression Model
FEVD	Forecast Error Variance Decomposition
VECM	Vector error Correction Model

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Equity and stock exchange markets are generally termed as financial market places where investors connect to buy, sell or exchange equity instruments (Borowski, 2010). This creates a liquidity of shares of public corporations and publicly listed companies leading to growth hence their role in the economy cannot be sidelined (Olokoyo & Babajide, 2020). Such financial transactions are done through formal exchanges or over-the-counter markets that operate under a set of defined regulations. Stock markets in an economy are responsible for the capital allocation as they are platforms used for raising of capital by companies or investors for the purposes of growth, expansion and innovation hence creating investment channels for the surplus funds (Mohammed, 2011).

Various research conducted by analysts, decision makers and researchers are of the common agreement that stock markets constitute a fundamental component of the financial sector within the economy. The securities market provides avenues in which individual and institutional investors invest in their savings (African Development Bank Group, 2018). Investors can either earn a potential return on investment from dividends or by capital gains towards the most efficient and profitable economic fields (Ogiri & Orlu, 2020). This enhances saving and investments fueling economic activity hence its accurate to state that growth and development of equity markets fosters overall economic growth (Asaolu & Ogunmuyiwa 2010).

A well-functioning security's market is crucial forming a pivotal bridge to fostering economic growth by facilitating capital accumulation and promoting an efficient allocation of financial resources (Buyuksalvarcu & Hassan, 2010). Consequently, the interplay between macroeconomic variables and stock market development is of critical importance, as these variables significantly influence both the expansion of financial markets and the returns generated therein (Zablonb, Maithya & Kitatia, 2015). It is therefore of paramount significance, as these factors exert considerable influence on both the expansion of financial markets and the returns generated within them. The fluctuations in stock market prices are primarily driven by key macroeconomic indicators, including Gross Domestic Product (GDP), interest rates, inflation levels, exchange rate fluctuations, unemployment rates, government expenditure, fiscal policy measures, international trade dynamics, and the consumer confidence index (Banda, 2018).

Stock market indices serve as essential tools for assessing historical market performance, offering key significant overview on the conclusive health of an economy (Capital Markets Authority, 2018). The trajectory of stock market prices is often perceived as a reflection of investor sentiment regarding the future economic outlook. A notable increase in stock market valuations typically signifies heightened investor confidence and a long-term commitment to capital investment, whereas a declining market may indicate economic uncertainty or potential downturns (Rashid & Khalid, 2017). Consequently, stock market indices function as crucial benchmarks for evaluating the performance of individual investment portfolios relative to broader market trends. Investors rely on these indices to assess their returns against prevailing market conditions, while policymakers utilize them to gauge economic patterns and formulate responsive economic policies. (Ngugi, Maana, & Amanja, 2013; Wanja, 2017).

A comprehensive understanding of the interplay involving macroeconomic variables and stock market growth and performance is of critical importance to investors, corporate managers, and policymakers, as it underpins informed and strategic decision-making (John, 2019). Existing empirical literature has extensively explored the macroeconomic indicators impact on stock market evolution, acknowledging that these variables often exert varied and sometimes asymmetric effects on financial markets and the broader economy (Vejzagic & Zarafat, 2013). Such insights are essential for anticipating market trends, formulating effective fiscal and monetary policies, and optimizing investment strategies within an increasingly dynamic economic environment (Aurangzeb, 2018).

Stock exchanges facilitate buying and selling of shares providing liquidity for investors (Kim, 2018). The investor's ease to entry and exit their investment position enhances participation hence ensuring efficient price discovery, liquidity position, transfer of risks and reduced costs in transactions. Information dissemination in the stock markets is accessible to all participants, contributing to market efficiency, where current prices reflect all information disclosed by market actors (Yartey & Adjasi,2007). Fama (2014) stated it's practically not possible to continually out do the market by making returns on investment outperforming the all-round average of the market depicted in the major stock indexes as stocks invariably trade at their fair market value.

Otieno, Ngugi & Muriu (2018), are of the similar opinion suggesting that returns in the stock market are influenced by news acquired at random in the stock market. This news could result to a change in behavior of an investor resulting to interest rates, inflation and foreign exchange rates changes. Ideally, according to the Efficient Market Hypothesis (EMH), any new macroeconomic information, such as changes in Gross Domestic Product (GDP), should be instantaneously reflected in stock market returns (Patatoukas, 2020). EMH asserts pricing of asset

to always incorporate and project all present and reliable information, proving that no investor can consistently achieve abnormal returns via market timing or strategic stock investment selection for an optimum portfolio. In support of this view, Ombongi (2014) asserted that higher returns cannot be attained through chance or by merely investing in riskier assets, as markets efficiently adjust to new data, negating attempts to outperform the market consistently.

However, the existence of market anomalies and the possibility of mispricing necessitated alternative models such as the Arbitrage Pricing Theory (APT), introduced by Ross (1976). Unlike the EMH, which assumes perfect market efficiency, APT acknowledges that securities may be temporarily mispriced (Uppal, Zaffaroni & Zviadadze, 2018). According to the model of APT, returns on financial asset is influenced by multiple systematic macroeconomic risk factors, including inflation, interest rates, and GDP which introduce fluctuations in asset prices, particularly when markets deviate from equilibrium conditions (Nyanga & Qutieshat, 2022). A key assumption of APT is that, once at equilibrium, the expected return on an arbitrage portfolio should be zero. Any deviation from this equilibrium invites arbitrage activity, which subsequently works to realign asset prices with their intrinsic fair values.

APT offers a more flexible framework compared to single-factor models, by allowing for a multifactor explanation of asset returns (Torbira & Agbam, 2017). This is operationalized through the use of beta coefficients, which measure the sensitivity of an asset's return to changes in specific macroeconomic factors. allowing for a more nuanced understanding of how various macroeconomic variables (Hidayat et al., 2018). Despite its theoretical robustness, one of the challenges of applying APT lies in the identification and measurement of relevant macroeconomic variables that significantly influence asset returns. Empirical research, including the study done by Chan, Roll, and Ross (1986), incorporated macroeconomic indicators including interest rates,

inflation, exchange rates, and GDP within the APT model framework. Their findings demonstrated that these factors systematically influence stock returns by affecting both expected dividends and discount rates (Mahdy F. Elhusseiny et al., 2019).

Recent studies continue to emphasize the uncertain and evolving influence of macroeconomic fundamentals on financial market outcomes in emerging economies. For instance, Odhiambo (2023) and Anyango & Achieng (2024) highlight how inflation and exchange rate volatility can hinder investor participation and undermine stock market confidence in Kenya. Similarly, IMF (2023) notes that despite structural reforms, Kenya's financial markets remain vulnerable to external macroeconomic shocks.

Nevertheless, there is still no consensus in the literature regarding the definitive macroeconomic determinants of stock market development. This lack of agreement is particularly pronounced in emerging economies, underscoring the need for further empirical investigation. In countries such as Kenya, it is essential to identify and understand the key macroeconomic variables that drive stock market growth and performance.

1.2 Macroeconomic Variables

Macroeconomic factors are factors that affect the wider economy. They deal with the economy as a whole at countrywide or regional levels (World Bank, 2018). Some of these variables include, inflation, interest rates, exchange rate, employment rate, GDP, international trade, consumer confidence and Government spending and fiscal policies (Banda, 2020). Dynamic shifts in the macroeconomic factors have a diverse effect on the economy thou emerging markets are lacking even with the recent innovation of macroeconomic fundamental variables in emerging markets (Badullahewage, 2018).

Gross Domestic Product (GDP) is widely acknowledged as a fundamental economic indicator, quantifying the total market value of all final goods and services produced within a nation during a designated fiscal year (Verma & Bansal, 2021). GDP per capita, a derived metric, serves as an indicator of the average standard of living and is intricately associated with national accounting methodologies. Following the Bretton Woods Conference in 1944, GDP emerged as the primary instrument for assessing a nation's economic performance. An increase in GDP generally signifies economic growth, whereas a decrease indicates recessionary trends (Igoni et al., 2020). A recent investigation by the Italian National Institute of Statistics (2023) analyzed the relationship between GDP growth and stock market returns in developed economies, revealing a positive correlation that implies economic growth plays a significant role in enhancing stock market performance and the overall development of financial markets (Dube, 2020).

Inflation, another crucial macroeconomic variable, quantifies the general rise in prices of goods and services in perpetuity. According to Sloman & Kevin (2007), inflation may manifest in the form of demand-pull or cost-push inflation. It reflects the rate at which the purchasing power of money erodes, impacting both consumers and firms. As noted by Clark and Wachter (2020), inflation results in a decrease of real income and purchasing capacity. It also introduces volatility into the financial markets, potentially influencing investor behavior and undermining the predictability of stock market returns. Therefore, inflation serves as an important predictor of macroeconomic stability and investor confidence.

Exchange rate denotes the value of one currency in relation to another and is determined within foreign exchange markets. Variations in exchange rates can significantly impact international trade, capital flows, and stock market dynamics. World Bank (2023) explores how exchange rate fluctuations affect international trade patterns whereby they facilitate international

trade and investment by enhancing currency conversions. This enables the speculation of currency values and carry trade speculation based on interest rates differences between the two currencies.

Interest rates are defined as a percentage of the borrowing cost per year which is necessary for investment decision making for the purchase and production of goods in a particular country. This is achieved by determining the adjusted interest for expected inflation denoted by the real interest rates. Obstfeld M, & Rogoff K. (2014) indicate that an increase in domestic interest rates relative to foreign investment rates results in a capital inflow to the host country.

1.2.1 Stock Market Development

Stock markets are financial marketplaces where investors connect to buy, sell or exchange equity creating liquidity of shares of public corporations and publicly listed companies leading to growth (Kreinovich & Sriboonchitta, 2018). Such financial transactions are done through formal exchanges or over-the-counter markets that operate under a set of defined regulations. They create efficient price determination and efficient dealings. Financial development in a stock market's role is to boost economic growth and act efficiently as intermediaries (Al- Malkawi et al., 2012; Hossein & Yazdan,2007; Greenwood et al., 2015; Murinde, 2012; Uddin et al., 2013).

A stock market with high liquidity can accommodate a bulky and diversified issuance of several stocks with a minimum effect on prices (Seetharam, 2015). Liquidity is the ability to convert an asset or a security into cash without affecting its market price. The more liquid an asset is the faster it is to turn it into cash. Less liquid assets take time to convert hence more expensive. In this context, stock market liquidity emerges being a key indicator of evolution of the security's market, representing the capacity for investors to buy or sell securities with minimal influence on their prices (Mungai, M., & Otieno, K. 2023). Liquid markets foster efficient trading, reduce

investment risk, and enhance the attractiveness of financial assets by allowing investors to seamlessly adjust their portfolios. Furthermore, liquidity promotes long-term investments, facilitates better capital allocation, and supports sustained economic growth (Muriuki, 2014).

Market capitalization is another vital metric used to gauge stock market development. It is calculated by multiplying the market price of a company's share by the total number of outstanding shares, thereby representing the aggregate value of a company listed on a stock exchange (Marzuki & Newell, 2018). This measure serves as a proxy for market size, growth potential, and investor confidence. Levine (2008) emphasized the significance of pricing effects in shaping market capitalization, noting that traded value ratios offer a more accurate reflection of liquidity adjustments. Similarly, Chordia, Roll, and Subrahmanyam (2008) highlighted the role of market capitalization as a foundational indicator of financial market development.

The Nairobi Securities Exchange (NSE), formerly the Nairobi Stock Exchange, underwent a significant transformation in July 2011. Originally founded in 1954 as a voluntary association of European stockbrokers under British colonial rule, the NSE restructured itself to become a fully-fledged securities exchange capable of facilitating the trading, clearing, and settlement of various financial instruments, including equities, bonds, and derivatives. In alignment with global financial practices, the NSE joined the United Nations Sustainable Stock Exchanges (SSE) initiative in March 2015, signaling its commitment to promoting sustainable and transparent capital markets.

Several key performance indicators are employed to assess stock market activities at the NSE, including the NSE All-Share Index, the NSE 20-Share Index, and the NSE 25-Share Index. The NSE plays a pivotal role in mobilizing capital from savings, investors, and financial institutions, thereby serving as a conduit for corporate entities seeking investment financing. The

liberalization of Kenya's stock market in 1995 led to a substantial increase in market transactions, fostering greater openness, higher share turnover, and expanded market capitalization (NSE, 2018).

As one of Africa's leading and most dynamic stock exchanges, the NSE has demonstrated significant growth, contributing to the economic development of Kenya and the broader Sub-Saharan region. Established in 1954, it facilitates the trading of both equity and debt securities while accommodating local and international investors seeking entry into the African financial markets. The self-listing of the NSE in 2014 marked a pivotal milestone, allowing for a separation between ownership and management while ensuring alignment with global market trends (NSE, 2019).

In April 2022, the NSE expressed its intention to acquire stakes in additional African stock exchanges, positioning itself as a key player in regional market integration. With a total of 66 listed firms, the NSE ranked as the fifth-largest stock exchange in Africa by market capitalization. By December 2022, the NSE had established linkages with seven other African capital markets, facilitating cross-border investments across 14 African economies (GOK, 2022). However, within the same period, foreign investor participation in NSE trading declined significantly, with foreign trade volumes halving within a single week (NSE, 2019). As of 2018, the four largest companies on the Nairobi Securities Exchange (NSE) in terms of market capitalization were Safaricom, East African Breweries Limited (EABL), Equity Group, and Kenya Commercial Bank (KCB) (NSE, 2018; Ngugi, Maana, & Amanja, 2013; Wanja, 2017).

1.2.2 Macroeconomic variables and Stock Market Development in Kenya

The development of stock markets is crucial for the mobilization of both domestic and international capital, the promotion of investment, and the acceleration of economic growth (Bhowmik & Wang, 2020). Stock markets are fundamental to the development of modern economies as they serve as platforms for capital mobilization, price discovery, and risk distribution (Bongini et al., 2017). In emerging markets like Kenya, a widely utilized metric for assessing stock market development through the lens of market capitalization as a percentage of GDP offers a critical insight into the depth and vibrancy of the financial system which acts as an indicator relative to the size of the economy and efficiency of a nation's stock market within its economic framework (Capital Markets Authority, 2020).

Empirical research has established connections between several macroeconomic variables and this indicator, including GDP growth, inflation, interest rates, and exchange rate stability. These indicators determine the overall investment climate and, in turn, the capacity of the stock market to attract both domestic and foreign investors.

Economic growth is a key driver of stock market expansion. A rising GDP implies increased corporate earnings, higher household income, and greater investor optimism, all of which lead to higher market capitalization (Onyango et al., 2023). In Kenya, studies have shown that GDP growth positively correlates with stock market development. Githinji, Simiyu, and Omagwa (2024) assert that GDP growth exhibits a positive correlation with stock market capitalization, as increases in national income levels tend to enhance corporate profitability and stimulate investor engagement. Their study also ascertained that increased output and fiscal stimulus during recovery periods, such as post-COVID, contributed to improved investor sentiment and trading activity at the Nairobi Securities Exchange (NSE). Similarly, global studies affirm that sustained GDP growth supports capital market expansion in both developed and

emerging economies (Levine & Zervos, 2016). A sustained trajectory of GDP growth is often indicative of economic stability and optimism, which in turn fosters equity investments and enhances market depth.

Conversely, inflation typically exerts a detrimental effect on stock market development. Elevated and volatile inflation rates diminish purchasing power and heighten economic uncertainty, thereby undermining investor confidence in long-term securities (Belay, 2024). However, moderate inflation may signal robust economic activity, thereby supporting equity valuations. Inflation, particularly when unpredictable, introduces uncertainty into the investment landscape. High inflation rates diminish real returns on equity and reduce investors' willingness to hold long-term financial assets. This dynamic is evident in the Kenyan context, where periods of inflation volatility have been associated with suppressed equity valuations and low market activity (Waweru & Kalunda, 2019). Global comparative studies, such as by Ho and Odhiambo (2018), reinforce the view that inflation has a negative impact on stock market development across African markets.

Interest rates represent another significant macroeconomic variable influencing stock market development. High interest rates elevate borrowing costs, which can deter firms from seeking capital through equity issuance and reduce disposable income available to retail investors. In contrast, environments characterized by low interest rates often prompt a transition from fixed-income assets to equities in pursuit of superior returns (Damankeshideh et al., 2024). Interest rates influence investment decisions through their effect on the cost of capital. High interest rates discourage borrowing and divert investor attention toward fixed-income securities, thus reducing equity demand. Conversely, a low interest rate environment promotes stock market investment. Empirical evidence from Kenya shows that commercial bank lending rates are inversely associated

with NSE capitalization trends (Odongo & Kipkoech, 2020). Comparable findings have been reported across Sub-Saharan Africa, underscoring the need for interest rate policy coordination to foster capital market development (Adelegan & Radzewicz-Bak, 2021).

Exchange rate volatility also plays a role in shaping market capitalization. Stable exchange rates tend to attract foreign investment in domestic equities, thereby facilitating market expansion, while erratic fluctuations can introduce risk and lead to capital flight, as highlighted by Dehghan Dehnavi and Amiri (2024). This sensitivity is particularly pronounced in emerging markets, where capital mobility and investor sentiment are highly reactive to currency fluctuations. Kenya's open capital account means that exchange rate movements significantly influence foreign investor behavior. A stable exchange rate promotes investor confidence and facilitates the inflow of portfolio investment, while sharp depreciations deter investment and erode existing capital value. Evidence by Kimani and Mutua (2022) indicates that exchange rate volatility has historically coincided with reductions in market capitalization ratios in Kenya. This is consistent with global findings that macroeconomic stability especially currency predictability is a prerequisite for sustained stock market growth (Kose et al., 2020).

The quality of institutional and regulatory frameworks further influences the effects of macroeconomic variables. For instance, robust financial institutions and effective investor protections can mitigate the adverse impacts of inflation or interest rate volatility, thereby sustaining market growth in the face of macroeconomic shocks (Sultan & Mouselli, 2025). In developing nations such as Kenya, these dynamics are particularly significant due to limited market depth and heightened vulnerability to external economic disturbances.

In summary, the existing literature indicates that GDP growth and exchange rate stability are positively correlated with stock market development, whereas inflation and elevated interest rates tend to impose constraints. The interplay of these variables highlights the necessity for coordinated macroeconomic and financial sector policies aimed at bolstering investor confidence and enhancing the resilience of capital markets. Beyond macroeconomic fundamentals, institutional quality including regulatory efficiency, financial literacy, and investor protection conditions how macroeconomic variables affect stock market development. Githinji et al., (2024) emphasize that even in periods of favorable macroeconomic indicators, the Kenyan stock market has underperformed due to limited participation and trust in market institutions.

1.3 Statement of the problem

Developed financial markets are typically characterized by more efficient resource mobilization, which in turn promotes higher domestic savings among the local population. As these savings accumulate, they facilitate the expansion of investment opportunities and the accessibility of a broader range of financial instruments. This has been done by developing of public private partnerships, development of the financial sector, strong telecommunication infrastructure and providing both fiscal and non-fiscal incentives to foreign investors (NSE, 2022). This process contributes significantly to the growth and evolution of financial markets (Levine, 2014). In contrast, foreign investment in Kenya remains relatively limited, constrained by the country's economic size, existing levels of international debt, and its status as a developing economy.

Despite these limitations, the Nairobi Securities Exchange (NSE) has been undergoing a series of structural reforms aimed at enhancing its operational efficiency and attractiveness to investors. These reforms include an increase in the number of listed companies, licensing of

regulatory authorities and credit rating agencies, and the introduction of investment banks (NSE, 2019). The overarching goal of these initiatives is to consolidate existing sectors, broaden market participation, and create an enabling environment for both local and foreign investment. In support of this agenda, the Kenyan government has implemented policy measures such as strengthening public-private partnerships, expanding the financial sector, investing in modern telecommunication infrastructure, and offering both fiscal and non-fiscal incentives to attract foreign capital (CMA, 2019).

Examination and understanding of the intricate relationships between macroeconomic variables and the development of stock markets is essential for facilitating informed decision-making among investors, policymakers, and other stakeholders in the financial arena. Numerous studies sought to conceptualize causal relationships inherent in macroeconomic indicators and financial market evolution and performance. As Tiryaki, Ceylan and Erdoğan (2019) observed, economic outcomes are typically influenced by underlying macroeconomic conditions, highlighting the principle that economic variables are interrelated.

Alzoubi (2022) demonstrated profound evidence that inflation and growth of an economy positively influence stock market evolution and development, particularly in the context of investment strategies such as hedging. Similarly, Ting et al., (2012) conducted an analysis of the Malaysian stock exchange and identified interest rates, exchange rates, and industrial production as significant determinants of equity market performance fluctuations. In Pakistan, Suleiman et al., (2009) identified a substantial impact of exchange rates and foreign exchange reserves on the stock market, particularly following financial sector reforms in 1991. A related study by Adam & Tweneboah (2012) investigating the Ghanaian stock market from 1991 to 2006 revealed that

foreign direct investment (FDI) and interest rates were the primary drivers of stock index movement, as shown through Impulse Response Function (IRF) analysis.

In the Kenyan context, multiple scholars have explored the nexus between macroeconomic variables and stock market development. Ndunda (2016) identified a positive correlation among inflation, exchange rates, GDP, money supply, and the performance of the NSE. However, findings by Ochieng & Oriwo (2012), who examined data from 2003 to 2013, did not yield conclusive results, primarily due to the short duration of the study and the use of data derived solely from the share index, which included both performing and underperforming firms.

Further, Mutuku (2013), reported a negative association between inflation and stock market performance, while (Mongeri, 2011) found that exchange rates negatively influenced the stock market. These divergent findings highlight the lack of consensus within the existing literature and point to methodological shortcomings, including inadequate consideration of individual macroeconomic variables.

Despite the implementation of ongoing reforms within Kenya's capital market and a variety of policy incentives designed to enhance the depth of financial markets, the development of the stock market remains suboptimal. The Nairobi Securities Exchange (NSE), recognized as one of the most active exchanges in Africa, continues to face challenges related to low levels of market participation, particularly among foreign investment (World Bank, 2023). Previous research has produced mixed and often inconclusive findings regarding the impact of macroeconomic variables specifically GDP, inflation, interest rates, and exchange rates on stock market evolution and development in Kenya.

This lack of empirical consensus, along with methodological shortcomings such as limited data periods and reliance on aggregated indices, highlights the pressing need for a thorough and longitudinal analysis. Consequently, this study aims to explore the dynamic interactions by isolating the impact of each significant macroeconomic factors independently to stock market evolution and development in Kenya over a span of 23 years, utilizing robust econometric techniques to examine both short-term fluctuations and long-term equilibrium relationships. By doing so, the study intends to offer new insights into how key economic variables interact with financial market development in an emerging economy context towards attraction of stock market development.

1.4 Objectives of the Study

1.4.1 General Objective

The main objective of this study is to determine the relationship between macroeconomic factors and stock market development in Kenya.

1.4.2 Specific Objectives

i. To determine the relationship between Gross Domestic Product and stock market development in Kenya.
ii. To ascertain the relationship between inflation and stock market development in Kenya.
iii. To assess the relationship between interest rates and stock market development in Kenya.
iv. To evaluate the relationship between exchange rates and stock market development in Kenya.

1.5 Research questions

i. What is the relationship between Gross Domestic Product and stock market development in Kenya?
ii. What is the relationship between inflation and stock market development in Kenya?
iii. What is the relationship between interest rates and stock market development in Kenya?
iv. What is the relationship between exchange rates and stock market development in Kenya?

1.6 Significance of the study

1.6.1 Fund and Investment managers

The Capital Market Authority and foreign investors in the market may use this study to serve as a guide in the prediction and determination of the securities to invest in. They are able to acquire information on various macroeconomic factors with significant impact on their returns in the stock market transactions.

1.6.2 Policy makers and Investors

Study findings proved to be necessary for both policy makers and investors in the development of investment strategic policies and necessary institutional framework required to understand effects of macroeconomic variables individually. These policies formulated should ensure the consistent development of the stock market leading to profitability increase, stock returns and savings for both local and foreign investors.

1.6.3 Academicians and Researchers

Future researchers, scholars, and students may find the study useful in the identification of further areas of research by identification of study gaps. Valuable research findings add onto the scope of understanding the relationship between macroeconomic variables and stock market development in Kenya as well as providing a background on which further research can be done on the topic and other related areas.

1.7 Scope of the study

This study aimed to examine the relationship between selected macroeconomic variables and stock market development in Kenya. Specifically, it focused on evaluating the influence of key macroeconomic indicators namely exchange rates, interest rates, inflation, and Gross Domestic Product (GDP) on the growth and performance of the stock market. The selection of these variables is grounded in a robust body of empirical literature, which consistently highlights their significant roles in shaping stock market behavior and development.

The study encompassed the period from 2000 to 2023, employing quarterly secondary data sourced from reputable and authoritative institutions. These sources included the Capital Markets Authority (CMA), the Nairobi Securities Exchange (NSE), the Central Bank of Kenya (CBK), the World Bank, the International Monetary Fund (IMF), and the United Nations Conference on Trade and Development (UNCTAD). This timeframe was characterized by considerable volatility in financial markets, driven by both domestic and global economic disturbances. Kenya faced episodes of political instability, including instances of civil unrest, which exerted substantial pressure on market dynamics. Additionally, international events such as the 2008 global financial crisis and the economic repercussions of the COVID-19 pandemic had significant effects on

financial systems worldwide, including those in emerging markets like Kenya. By concentrating on this pivotal period, the study provides a thorough analysis of the extent to which macroeconomic fluctuations have influenced stock market development within the Kenyan context.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The relationship between macroeconomic factors and stock market development has been widely explored through various theoretical lenses. This study is grounded in three core theories: the Efficient Market Hypothesis (EMH), the Arbitrage Pricing Theory (APT), and the Fama-French Three-Factor Theory. Each theory provides a unique mechanism for understanding how changes in macroeconomic indicators namely GDP, inflation, interest rates, and exchange rates influence evolution and development of stock market outcomes. For the study reference secondary sources of data and a quantitative research design was engaged. Sources of literature include; finance journals, published articles, finance and economic literature and any other key financial information available on the internet of relevance to the research outlook. Research gaps that may exist were exhaustively addressed in this chapter.

2.2 Theoretical Review

Different theories and studies by researchers and scholars have linked different relationships between Macroeconomic factors and equity/ securities market development for developing as well as developed economies. The below named theories were therefore devoted in the study. They include: Efficient Market Hypothesis, Arbitrage Pricing Theory model along with the Three factor Macroeconomic Factor Model.

2.2.1 Efficient Market Hypothesis Theory

A market is informationally efficient if its prices at each moment is inclusive of all information available in the market on future values (Eugene F Fama, 2014). Prices in the market are rational and valued precisely where by the present value of shares is adjusted to its fair values. In efficient stock markets stocks and securities trade at their fundamental values independent of all market conditions (Soumaré et al., 2021). The stock price is inclusive of all the information available in the market including all private and hidden insider information that may lead to an investor gaining higher returns by overpricing or underpricing of stocks (Teall, 2018). The market is always right and no one can outsmart the market only by chance as the stock price is fast to react to any new reported information on the market as it contains a view of all investors in the market. Ombongi (2014) stated that no investor should gain increased greater returns by sheer luck or by investing in a more riskier portfolio hence acquiring higher returns by proper market selection or timing to outperform the overall market.

Fama (1970) stated it's practically not possible to continually out do the market by making investment returns that outperform the all-round market average depicted in the major stock indexes. Mean reversion is a financial theory that suggests the stock price eventually tends to move back towards its historical average or mean over time (De Bondt & Thaler, 1985). If a stock price shoots up or drastically drops it may likely come back to the mean or average its then possible to determine stock prices based on past information (Gulay & Emec, 2017). Technical indicators such as moving average or relative strength index can be used to identify mean reversion opportunities. This enhances arbitrage opportunities taken advantage of by arbitrageurs who seek to exploit the price difference by buying undervalued stocks and selling overvalued once hence influencing the movement of prices (Cheng, Jiang & Li 2012). Mean reversion is greatly affected

by market fundamentals, news events and the overall economic conditions that significantly influence stock prices by potentially overriding mean reversion tendencies. Mean reversion can therefore be used as a stock market strategy that proves that the market is not 100% efficient as suggested by Efficient market hypothesis.

Market efficiency is divided into three mainly a weak form efficient market hypothesis, semi-strong form efficient market hypothesis and a strong form market hypothesis (Ikeora, Nneka, & Andabai, 2016). Under the weak form EMH, it assumes the stock/ security price reflects all available information on the public market but the future price of a security can be determined by either technical or fundamental analysis. New information is not always reflected hence not available to the general public. It also assumes past information regarding price, volume and returns are independent of future prices. Semi-strong form of efficient market hypothesis disregards incorporating technical and fundamental analysis. The market assumes that prices are quickly adjusted accordingly to any new information available in the market. Fundamental analysis can therefore not be used to predict future price movements (Gatuhi, Gekara, & Muturi, 2015). Strong form of market efficiency hypothesis is of the assumption, current stock pricing mirror general public and private information alongside historical, new and insider information. Information also known to a firm's management and CEO is also factored in the stock price of a particular entity.

Criticisms of the EMH theory resulted to development of the Asymmetric information theory (Baker M, Barberis N, & Wurgler J:2020). The theory suggested that sellers at times may be in possession of more information than the buyers leading to price difference in the market. Foreign investors are known to have exclusive information on the shares of a company located elsewhere other than their source country hence venturing in the host country. Investors can also

predict the stocks to invest in and those to remove from their portfolio. This information is also used by both local and foreign investors for the construction of an efficient, effective and well diversified portfolio. However, the securities and equity market in Kenyan is still characterized with a semi strong EMH form resulting from limiting information asymmetry and impotence in the Kenyan equity market (Makil, 2011) The concept of EMH theory, developed by Fama (1970), posits that stock prices fully reflect all available information. Under this theory, macroeconomic data such as inflation reports, GDP figures, and interest rate adjustments are instantaneously incorporated into asset prices. Therefore, no investor can consistently outperform the market by exploiting public information. Applied to this study, the EMH implies that changes in GDP, inflation, interest rates, and exchange rates should be rapidly reflected in the valuation of securities at the Nairobi Securities Exchange (NSE), thereby affecting its development measured by market capitalization as a percentage of GDP (Patatoukas, 2020).

2.2.2 Arbitrage Pricing Theory

The Arbitrage Pricing Theory, proposed by Ross in 1976, is recognized as a framework for asset pricing that posits that the return on any financial asset can be ascertained through a linear interrelationship amidst the asset's returns to be expected and its associated risk in relation to macroeconomic factors (Ihsan et al., 2017). APT is viewed to be a multifactor model for pricing financial assets, securities or stocks as opposed to Capital Assets Pricing Model (CAPM) which is a criticized by experts as it only takes into account the market risk as a systematic risk which only interpret changes from returns by two financial assets relying on an individual factors to elaborate results (Sutrisno & Nasri 2018) and it decomposes the risk of a portfolio into systematic risks.

Arbitrage Pricing Theory looks into several macroeconomic factors affecting asset prices such as; inflation rates, interest rates, exchange rates and economic growth to determine the systematic risk and expected return of specific financial assets (Ross et al., 2013). An investor is in a position to diversify their portfolios, choose their risk return profiles based on the premium and sensitivity to these macroeconomic variables (Sheeba Kanil, 2011). Risk taking investors take advantage of the expected return and real return differential on assets by use of arbitrage. APT is articulated on the principle of the law of one price. It suggests that in any competitive financial market, two similar financial assets with equitable characteristics must possess similar expected returns and must be priced similarly. If the two financial assets with the similar risk are priced differently an arbitrage opportunity arises. Hence, APT follows a linear pattern on financial asset returns that can be leveraged using arbitrage (Mazumder, 2021).

Market participants expect to buy asset with low worthwhile selling assets with high worth acquiring a risk-free profit. The financial asset value however, experience adjustments due to the arbitrage process where low worth asset prices increase gradually while high worth asset prices decline to reach an equilibrium at a constant price. This in the long term creates perfect efficient markets where any opportunity to gain arbitrage profits is eliminated (Azis et al., 2015; S Hombing 2018).

APT expands the scope of market analysis by incorporating multiple macroeconomic variables as determinants of asset returns. According to APT, returns on financial assets are linearly related to a set of systematic risk factors such as interest rates, inflation, and GDP growth (Nyanga & Qutieshat, 2022). These variables act as risk premia, each exerting a specific influence on the pricing of securities. In this study, APT provides the analytical foundation to assess how GDP, inflation, interest rates, and exchange rates collectively influence the valuation and size of

Kenya's stock market. This model's flexibility makes it particularly useful in emerging market contexts, where inefficiencies and structural volatility may alter investor responses to macroeconomic stimuli (Ross et al., 2013; Eldomiaty et al., 2021).

2.2.3 The Macroeconomic Factor Theory (Three Factor Model Theory)

Fama & French, (1993) created the Fama-French three factor macroeconomic model theory provides a framework which facilitated the in-depth analysis to address the inconsistencies observed in the Capital Asset Pricing Model (CAPM). The model rectifies these inconsistencies by integrating additional factors that capture and account for the influence of distinctive macroeconomic elements on returns in the stock market as well as the intricate interaction amid economic growth and stock markets. The model was also enhanced to address the poor execution and practicability of CAPM in interpretation of the returns obtained.

The Fama-French model theory comprises three primary key factors: the market factor (MKT), which represents the overall market return, defined as the excess return of the market portfolio over the risk-free rate; the size factor (SMB), that quantifies excess returns of small cap equity/ stocks relative to large cap securities portfolios, commonly referred to as the effect of size; and lastly the value factor (HML), that aims to assess the differential returns between stocks with high book to market values and those with low book to market values, referred to as the effect of value. The model is characterized with asymmetric market cycles whereby, a response to macroeconomic factors triggers the stock market to show asymmetric behavior. A high interest rate and high sentiment can lead to increased excess returns while a low interest rate and low sentiment results to decreased excess returns (Baker & Wurgler, 2006). As market participants seek to mitigate the challenges of the global economy, this model seeks to provide more conclusive

risk adjusted returns. This is made possible as the models provides a factor-based investment where investors can select stocks for investment based on their exposure to specific macroeconomic factors.

The Fama-French theory (1993) extended CAPM by including size and value factors in addition to market risk. Although not explicitly developed for macroeconomic analysis, its components offer a framework to understand how economic fundamentals influence portfolio returns. For instance, GDP growth and inflation can affect the market factor, while changes in exchange rates may influence the valuation of large versus small firms. This model supports an investor-based perspective, linking sentiment and fundamentals to expected returns, and is particularly useful for explaining stock market development in markets characterized by size and value asymmetries, such as the NSE (Stambaugh et al., 2012; Baker & Wurgler, 2006). The insights provided by the Fama-French model theory encouraged and provided more helpful insights to market participants and analyst in making more informed investment decisions in the stock market.

2.3 Empirical Review

2.3.1 Gross Domestic Product and stock market development

The nexus between Gross Domestic Product and stock market development is multifaceted and shaped by various economic and institutional factors. As a core indicator of a country's economic output and performance, GDP serves as a central indicator of economic performance and health (Harun & Afanddi, 2021). The prevailing theoretical perspective posits a positive association between GDP growth and stock market development. This view is grounded in the notion that economic expansion enhances corporate profitability, which, in turn, increases stock valuations

and stimulates capital market activity (Kesuma & Trisnawati, 2024; Patatoukas, 2021). Under this context, rising GDP is often linked to higher firm revenues and broader investor optimism and confidence, thus facilitating stock market growth.

Nonetheless, empirical findings on this relationship have been mixed. While several studies support the positive association between GDP and stock market performance, others have identified contextual or conditional variations based on broader economic cycles, investor expectations, and structural market differences (Akkutay, 2024; Babar et al., 2024). These divergences underscore the necessity of examining GDP in conjunction with additional macroeconomic and institutional variables. Nguyen and Kim (2022), for instance, analyzed the Vietnamese stock market from 2009 to 2019 using the Autoregressive Distributed Lag (ARDL) model. Their results indicated that GDP and the Consumer Price Index (CPI) had a statistically significant positive impact on stock prices, while interest rates, money supply, and oil prices had inconsistent effects. Similarly, Jarrar (2021) assessed the role of stock market development in Jordan's economic growth using time-series data and ARDL analysis. The findings revealed that stock market expansion and increased private sector credit contributed positively to economic growth, although the effect of credit to the private sector alone was statistically insignificant.

In contrast, Lei and Mishra (2018) observed a long-term negative relationship between stock market development and GDP growth in China, attributing the result to excessive financial market expansion and inefficiencies within the banking sector. Their analysis showed no significant short-term correlation, suggesting delays in market adjustment or flaws in resource allocation mechanisms. In South Korea, Kim, Patel, and Park (2017) conducted a time-series analysis over a 20-year period to explore the dynamic relationship between economic growth and stock market volatility. They identified a nonlinear pattern, where moderate growth helped reduce

volatility and fostered stability, whereas extreme economic fluctuations either upward or downward amplified volatility and hindered market development.

In Nigeria, Adamu and Mustafa (2023) utilized Johansen co-integration and Vector Error Correction Models (VECM) to evaluate the long-term impact of capital market development on economic growth from 1985 to 2021. Their results showed that market capitalization and the number of deals had a positive influence on growth over the long term. However, the all-share index and transaction values had a negative effect. In the short term, most indicators demonstrated a positive correlation with GDP, except market capitalization, which exhibited a negative association. Collin (2023), examining Zimbabwe during a period of economic instability and inflation, applied a Vector Autoregressive (VAR) model using quarterly data from 2013 to 2022. The study reported a statistically significant positive correlation between stock market development and GDP growth at the 10% level, despite the challenging macroeconomic environment. Dibor Alfred et al., (2023) analyzed Nigeria's capital market between 1985 and 2021 using the ARDL approach. They employed market capitalization, transaction values, and the all-share index as proxies for stock market activity, with GDP as the dependent variable. Their results emphasized the crucial role of sound government policies in creating a conducive macroeconomic climate that enables the stock market to positively influence economic performance.

In the Kenyan context, Wahome (2019) investigated the long-run association between stock market development and economic growth through a VAR model, using GDP growth and market capitalization (as a percentage of GDP). The study found a unidirectional causality from stock market development to economic growth, with a negative correlation between market liquidity and GDP growth. Likewise, Owiti (2014) employed Granger causality tests and the NSE 20 Index for the period 2000–2013, revealing a one-way causal relationship from economic growth

to stock market development. These results are consistent with earlier findings by Olweny and Kimani (2012), who also reported unidirectional causality from GDP growth to market performance.

In conclusion, while the theoretical premise and a significant portion of empirical literature support a positive relationship between GDP growth and stock market development, the direction and magnitude of this effect vary considerably across countries. Factors such as market maturity, institutional frameworks, macroeconomic stability, and government policy play a critical role in shaping the strength and nature of this linkage. Consequently, context-specific analyses are essential to fully understand the dynamics between economic growth and capital market development.

2.3.2 Inflation and stock market development

Inflation, defined as the rate at which the general price level of goods and services in an economy rises, leads to a corresponding decline in the purchasing power of money (Ardyansyah & Ummah, 2024). As a key macroeconomic indicator, inflation significantly influences investor expectations, corporate profitability, and ultimately, stock market performance. The theoretical basis linking inflation to stock market development stems in its effects on investment patterns, production costs, and consumer demand and behavior (Hasibuan et al., 2023). However, the nature of this relationship is intricate and depends on several factors, including the magnitude and persistence of inflation, market expectations, and the types of securities involved.

Moderate inflation is often perceived as beneficial or neutral for stock markets, as it is typically associated with economic growth and rising corporate revenues (Pamungkas et al., 2023; Pradhan et al., 2020). Conversely, high and volatile inflation tends to exert a negative influence on

stock markets by introducing uncertainty, increasing production costs, and reducing consumer spending, all of which may undermine investor confidence and hinder capital market growth (Abdali & Alm, 2024). For these reasons, inflation remains a critical variable for forecasting economic stability and guiding investment strategy.

Several empirical studies have examined the inflation-stock market relationship across various economies. Eldomiaty et al., (2022) analyzed data from non-financial firms listed on the DJIA30 and NASDAQ 100 between 1999 and 2016. Using the stock duration model and Granger causality tests, they identified a statistically negative and predominantly a significant relationship between inflation and the securities market performance, suggesting that inflationary shocks negatively influence market dynamics. Similarly, Smith, Johnson, and Lee (2020) conducted a longitudinal study of the U.S. market using time-series econometric techniques to assess the dynamic interaction between inflation and stock market volatility. Their findings revealed a positive correlation, implying that inflation heightens uncertainty and contributes to increased market fluctuations, thereby reinforcing the importance of inflation in risk assessment and portfolio management.

In the case of emerging markets, Ramzan (2019) applied a Vector Autoregressive model and Granger causality test to assess the influence of inflation on stock market performance in Pakistan between 2009 and 2017. Study findings identified a negative relationship, emphasizing that effective inflation control through monetary policy is essential to fostering investor confidence and enhancing market performance. A related study by Sucuahi et al., (2018) focused his research in the Philippine stock market, examining the effect of inflation on stock price evolution and growth among diversified companies from 2010 to 2016. Although a positive association was

found, the impact was statistically insignificant, highlighting that inflation alone may not consistently predict market trends without considering additional economic factors.

Oladosu and Topbie (2022) explored the South African capital market using the MSCI index as a performance proxy. Applying an ARDL model to monthly data from 2000 to 2019, they examined the inflationary effect, measured via the CPI (Consumer Price Index), along with other macroeconomic variables. The study concluded that inflation had a negative but statistically significant effect on stock market performance, with causality tests confirming a unidirectional relationship from inflation to the market. In Nigeria, Iwegbu and Adeoye (2020) investigated inflationary expectations and their impact on stock returns during and after the 2007–2008 global financial crisis. Using the ARDL framework and quarterly data, the findings revealed a significant effect that was negative among current inflation on stock returns, while lagged inflation showed a positive correlation. The study rejected the classical Fisher hypothesis amongst the post-crisis era, suggesting that Nigerian equities do not effectively hedge against inflation. Jepkemei (2017) assessed the effect of inflation on stock market performance in Ghana between 2014 and 2017, concluding that inflation adversely affects stock returns and, by extension, economic growth. However, its narrow scope focusing solely on inflation limited its explanatory power overlooking the influence of other relevant macroeconomic variables.

In the Kenyan context, Kori (2019) analyzed macroeconomic influences on the Nairobi Securities Exchange (NSE) from 2008 to 2017. Using the NSE 20 Share Index as a proxy for market performance and applying SPSS for data analysis, the study identified a negative correlation between inflation and stock market performance. However, the use of the NSE 20—which only reflects the top 20 traded companies limited the study's generalizability. The current study addresses this gap by employing the Nairobi All Share Index (NASI), which provides a more

comprehensive measure of market activity across all listed companies. Similarly, Gachuchi (2018) conducted an evaluation of the influence of macroeconomic variables, including inflation, on the performance of the NSE from 2007 to 2017. The study also relied on the NSE 20 Index and concluded that inflation negatively impacts stock market development. However, like Kori's research, the exclusive use of a narrow index limited the comprehensiveness of the findings.

In summary, while most empirical studies identify a generally negative impact of inflation on stock market performance, the degree and direction of this relationship often vary based on the inflation level, economic structure, and analytical models used. In the Kenyan setting, existing literature largely supports a negative correlation. However, many studies have employed narrow market indicators, limiting their comprehensiveness. This study seeks to overcome such limitations by incorporating broader indices and evaluating inflation in conjunction with other critical macroeconomic factors, thereby offering a more nuanced analysis of stock market development.

2.3.3 Interest rates and stock market development

Interest rates, typically expressed as the annual cost of borrowing, play a fundamental role in shaping economic activity and investment behavior. Real interest rates those adjusted for expected inflation provide a clearer picture of the true cost of capital in an economy (Hiendrawati et al., 2024). According to Obstfeld and Rogoff (2014), a rise in domestic rates of interest rates relative to global benchmarks tends to pool foreign direct investments resulting to additional capital inflows, influencing general performance on local financial markets, including stock exchanges.

In the context of stock markets, interest rate announcements are considered pivotal information events. Such announcements may generate volatility through either pre-announcement effects, wherein investors act in anticipation, or announcement effects, where market participants

react to newly disclosed information. These interest rate shifts impact investor behavior and can significantly influence stock valuations. Fluctuations in interest rates affect multiple economic and financial variables, including consumer expenditure, investment levels, corporate earnings, dividend payments, and debt servicing costs. Interest rates also invariably adjust rates of discounts applicable to cashflows in the future, thereby present market values of financial assets are affected (Fahnayu et al., 2024). As Thomas (2016) noted, rising interest rates typically increase the attractiveness of fixed-income instruments, prompting capital reallocation away from equities toward safer assets such as bonds and money market instruments. Conversely, lower interest rates reduce borrowing costs and stimulate investment, enhancing corporate profitability and driving up stock prices, thus promoting stock market development (De Mendonça & Díaz, 2023).

However, increased borrowing costs associated with rising interest rates may deter investment and reduce corporate earnings, ultimately exerting downward pressure on stock market performance (Eldomiaty et al., 2021). In some instances, interest rate hikes aimed at controlling inflation may be perceived positively by investors, as they signal long-term economic stability and may attract foreign capital (Sergi et al., 2021).

Empirical research examining the interest rate stock market nexus across diverse markets has yielded varied results. Gu, Zhu, and Wang (2022) explored the Chinese securities market using a Bayesian time-varying regression model and determined that rates applied to interest effects on stock returns were not constant. Their results demonstrated a generally negative relationship, although in certain bullish economic periods, rising interest rates did not inhibit equity price growth. The authors emphasized the need for strategic interest rate adjustments by the Chinese central bank to promote stock market resilience. In Indonesia, Rachmawat (2022) applied panel data regression analysis to the Jakarta Islamic Index (JII) from 2018 to 2021, revealing a significant

negative but statistically significant correlation among interest rates and stock prices. Similarly, Maulani (2021) found that rising interest rates led to capital flight from equities to safer investment options, thereby suppressing stock market development on the Indonesian Stock Exchange.

Schmeling and Wagner (2019) extended this line of inquiry by investigating whether interest rate changes affect stock market development via stock returns. Their findings confirmed that falling interest rates often drive stock price appreciation, supporting market development. In contrast, rising interest rates, associated with higher bond yields, were linked to declining equity volatility, narrower credit spreads, and lower risk premia—highlighting the complex dynamics involved in monetary policy transmission. In the European Union, Jones, Patel, and Gupta (2016) utilized panel data from various member states to explore the interest rate volatility nexus. Their findings indicated a negative correlation, suggesting that higher interest rates were associated with reduced market volatility. This relationship underscores the importance of accounting for interest rate movements when assessing market dynamics and policy responses.

In Ghana, Sampene et al., (2021) employed the Johansen cointegration and error correction model to evaluate the impact of interest rates on the Ghana Stock Exchange. Research findings denoted that elevated interest rates significantly reduced and negatively impacted the composite values of the stock index, establishing a cointegrating affiliation in the long run as well as confirming key importance's of monetary policy in shaping stock market outcomes. Kamal (2020) analyzed data from the Egyptian Stock Exchange from 2004 to 2020, finding that both treasury bill rates and general rates of interest yielded negative statistically significant association with stock market returns. This result supports the notion that tighter monetary conditions may suppress market performance unless offset by strong economic fundamentals.

In Zimbabwe, Kganyago and Gumbo (2018) utilized a Vector Error Correction Model (VECM) to examine the bidirectional homogeneity between interest rates and equity returns. Their analysis reported short term causality from stock returns to interest rates as well as long run impact of interest rates on equity performance. Lower interest rates promoted investment, business activity and improved corporate earnings, while higher rates were associated with reduced economic activity and weaker stock market performance. Kim (2021) examined the role of interest rates in shaping market liquidity and its effects on volatility. Using a Vector Autoregressive (VAR) model applied on daily trading data, study findings demonstrated that changes in interest rates significantly influenced liquidity, trading volumes, and bid-ask spreads, which in turn affected market volatility. The findings emphasized the interconnectedness of monetary policy and market microstructure.

In Kenya, Otieno, Ngugi, and Wawire (2017) applied the Autoregressive Fractionally Integrated Moving Average (ARFIMA) model and Granger causality tests evaluating the interest rates effects on stock market returns between 1993 and 2015. Their results demonstrated that rates on treasury bills for a period of three months and lending rates showed fractional integration with equity returns, suggesting, while interest rate shock impacts are persistent, they diminish over time. Similarly, Mugambi (2016) investigated the degree of influence that the Central Bank Rate (CBR) has on Kenya's securities market evolution and development, simultaneously employing univariate and multivariate time series techniques using a VAR model. The study concluded that interest rate fluctuations significantly affect investment patterns within the commercial and banking sectors, underscoring the critical importance of management on interest rates in fostering financial market evolution and development.

In summary, empirical evidence indicates that interest rates exert a is predominantly inverse association with stock market development. Although, the strength and nature of this association vary depending on macroeconomic conditions, institutional frameworks, timeframes and policy environments. In the Kenyan context, interest rate sensitivity appears as a critical factor in stock market dynamics, highlighting the relevance of effective monetary policy management in fostering market development and investor confidence.

2.3.4 Exchange rates and stock market development.

Exchange rates, defined as the price at which one currency is exchanged for another, represent the relative value of currencies across nations. This valuation has significant implications for international trade, investment flows, and capital market behavior (Elkahky et al., 2024). Exchange rates are also integral to the monetary transmission mechanism, influencing the relative demand for domestic and foreign goods, and by extension, stock market performance (Ncube & Ndou, 2011).

Exchange rate fluctuations can directly impact stock returns by altering the competitiveness of a country's exports and imports, thus influencing corporate profitability. Investors with sufficient capital assess the net present value of expected future earnings, but when constrained by capital limitations and imperfect credit markets, borrowing becomes necessary introducing information asymmetries and monitoring costs that reduce investment efficiency (He et al., 2023). A stronger domestic currency may diminish export competitiveness, whereas a depreciating currency tends to enhance exports and improve earnings, particularly for export-driven firms (Krishnan & Dagar, 2022). Consequently, in economies reliant on exports, currency depreciation is positively associated with stock market development (Nwosa, 2021).

Empirical evidence supports this view. Chang, Kim, and Park (2018), employing a GARCH model across multiple developing economies between 2001 and 2017. Their study found a strong positive conjunction amid volatility on exchange rate and fluctuations in the stock market, emphasizing the importance of coordinated policy measures to cushion the destabilizing effects of exchange rate shocks, particularly during periods of economic instability and uncertainty.

Türsoy (2017), analyzing monthly data from the Turkish stock market between 2001 and 2016 using ARDL bounds testing, identified both a bidirectional conjunction in the long term as well as a unidirectional contingency in the short term from exchange rates to stock prices. This suggests that while exchange rate movements significantly affect equity prices, the reverse is not necessarily true, indicating an asymmetric causal relationship. Moussa and Delhoumi (2021) studied five MENA countries and found that exchange rate appreciation, particularly in Tunisia and Egypt, significantly increased stock returns. Their findings suggest that currency stability improves investor confidence, attracting both local and international capital and enhancing the broader development of capital markets.

Similarly, Najaf and Najaf (2016) examined the Indian rupee/USD exchange rate and its relationship with Nifty returns using Granger causality tests. Their study results indicated a negative association, underscoring those adverse effects of currency depreciation on investor sentiment and business planning can undermine investor sentiment and disrupt strategic business planning. Therefore, highlighting the critical importance of stable exchange rates for maintaining positive market momentum and overall performance. In the Nigerian context, Dada et al., (2023) applied the Nonlinear ARDL (NARDL) and asymmetric causality approaches to assess long and short-term dynamics between exchange rates and stock market performance from 1986 to 2019. Their study revealed that exchange rate shocks significantly heightened market volatility and

identified a unidirectional causality flowing from exchange rate movements to stock returns, implying that currency instability can have direct consequences on market performance.

Daggash and Abraham (2017) conducted a comparative study of exchange rate volatility in Nigeria and South Africa using a Vector Autoregressive (VAR) model. Their findings depicted that short run currency fluctuations had a more pronounced effect on the Nigerian stock market, whereas the Johannesburg Stock Exchange (JSE) demonstrated greater resilience to such volatility. This discrepancy was attributed to structural differences between the two markets and varying levels of macroeconomic stability. Ghobashi (2015), assessed Egypt's currency liberalization between 1991 and 2012 and found a negative correlation between real exchange rates and national product growth, although no significant impact was found on foreign investment or trade. These findings reinforce the notion that exchange rate policies have broader macroeconomic implications beyond the capital markets.

Focusing on the Kenyan market, Olweny and Omondi (2017) utilized EGARCH and TGARCH models to examine exchange rate effects on stock return volatility from 2010 to 2016. Their analysis revealed a weak but positive relationship, with short-lived volatility effects, implying that while exchange rates influence returns, the market quickly absorbs such shocks. Nyaga (2014) investigated exchange rate exposure among firms listed on the Nairobi Securities Exchange (NSE) in the commercial and services sectors. The study, based on event study methodology, found that exchange rate volatility negatively affected share prices, though its limited timeframe constrained the generalizability of the findings.

Mbithi (2013), using structured questionnaires and regression analysis across 46 listed firms from 2002 to 2012, found that exchange rate fluctuations significantly impacted financial performance. Foreign exchange risk influenced firm profitability through trade accounts and

balance sheets, thereby affecting stock market stability. The study also concluded that foreign exchange rate volatility affects firms' financial performance through imports, exports, accounts payable, and receivables, ultimately impacting net income and balance sheets.

In sum, the existing body of empirical evidence confirms that exchange rate volatility is a significant determinant of stock market performance, particularly in emerging economies. The sensitivity of stock markets to currency fluctuations underscores the need for stable exchange rate regimes and sound monetary policies to enhance investor confidence and promote sustainable capital market development.

2.4 Conceptual Framework

A conceptual framework illustrates the hypothesized relationships among variables in a study, guiding both the research design and data analysis. This framework is grounded in theoretical and empirical literature and reflects the central premise that macroeconomic factors exert measurable influence on stock market development.

In this study, stock market development serves as the dependent variable, while the independent variables are selected macroeconomic indicators, specifically:

Gross Domestic Product (GDP) – a proxy for overall economic activity and investor confidence.

Inflation Rate – influencing real returns, purchasing power, and investment behavior.

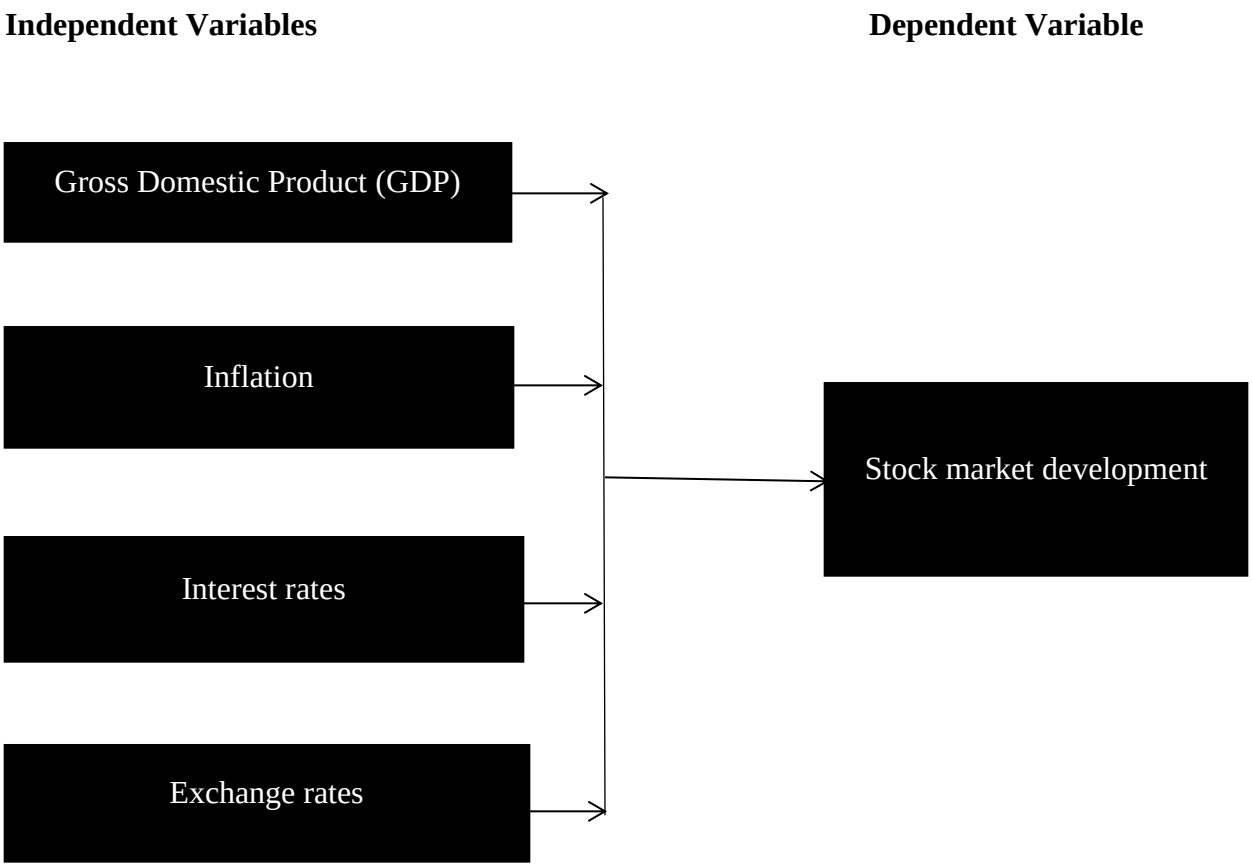
Interest Rates – affecting borrowing costs, discount rates, and investment shifts between equity and debt.

Exchange Rates – impacting corporate earnings, international competitiveness, and foreign investment flows.

The framework posits that variations in these macroeconomic variables influence the size, performance, and volatility of the stock market. The relationship can be illustrated as follows:

FIGURE 2.1

Conceptual Framework Model



2.5 Description and Measurement of Variables

The table below indicates the description and measurement of the variables incorporated in this study. If the variables depict a lack of stationarity on the original series, the variables were therefore be measured at first difference of the original series to achieve stationarity.

TABLE 1

Measurement Of Variables

Variable	Abbreviation	Measurement	Description
Gross Domestic Product	GDP	Quarterly GDP (first difference for stationarity)	Proxy for economic activity, adjusted to ensure stationarity in the time series
Inflation Rate	INF	Consumer Price Index (CPI) first difference	Proxy for inflation, measured quarterly to assess price level changes
Interest Rates	INT	Quarterly average lending rate (first difference)	Represents cost of borrowing and investment incentive
Exchange Rate	EXCH	Quarterly KES/USD exchange rate (first difference)	Measures currency stability and foreign investment impact
Stock Market Development	MKT_CAP	Market capitalization as a percentage of GDP	Proxy for stock market size and development, sourced from World Bank

2.6 Chapter Summary

The literature reviewed in this chapter encompasses various theoretical frameworks and empirical studies examining different economies and financial markets. These studies highlight the necessity of investigating the relationship between macroeconomic factors and stock market development.

The theoretical foundations underpinning this research include the Efficient Market Hypothesis (EMH), the Arbitrage Pricing Theory (APT), and the Macroeconomic Three-Factor Model.

Key macroeconomic variables explored in this study comprise GDP, interest rates, inflation, and exchange rates. This research aims to supplement and extend the existing body of literature while providing valuable insights for investors, policymakers, and other stakeholders in financial markets. By offering a comprehensive understanding of macroeconomic influences on stock market development, the study contributes to informed investment decision-making and policy formulation.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The consequent chapter describes distinct methods of research that were factored in so as to aid in determination of the nexus existing amongst macroeconomic variables and stock market development in Kenya. The section addressed the utilized research design, data collection of data process, methods used in analysis of data and the research models applied.

3.2 Research Design

A research design can be viewed as the glue retaining the project collectively (Trochim, 2015). The design is therefore useful in structuring the study as it aids in addressing various research questions by serving as a guideline in collection, scrutiny, analysis of data as well as ensuring protection of the research. This investigation of the study implores a descriptive research design which is usually characterized by gathering of information that deems useful in the determination of the functional associations amid the variables. The data under scrutiny in this study was quantitative and time series in its innate form that aided in ascertaining the interrelation existing between macroeconomic factors and stock market development by use of STATA 12 statistical software tool.

The descriptive research design alongside with the time series data incorporated in the study was strong and efficient in providing a solid foundation for understanding trends, patterns and seasonality in a dataset for a predetermined time period. This research design also focused on describing and analyzing the characteristics of variables over time by acquiring information

systematically and in detail to access the stock market development in depth and how its influenced by various macroeconomic factors based on the different theories that explain the relationship between these variables.

Quarterly secondary data was acquired and analyzed for the period of January 2000 to December 2023. This data was sourced from World Bank and UNCTAD databases, journals, daily business newspapers, Central Bank of Kenya, Kenya National Bureau of Statistics and other financial literature.

3.3 Target population

Target population is defined as the complete set of cases from which a sample data is drawn from by a researcher with interest in studying and drawing a conclusion on (Creswell, J.W, 2014). The study population was aimed to analyze quarterly data on the development of the Kenyan stock market between the period of January 2000 to December 2023. This data was acquired from the Nairobi stock exchange (NSE) as well as the World Bank database. This study however, incorporated secondary data acquired from the 64 firms currently listed in the NSE to determine market capitalization as a (%) of GDP. The data however contained one gap in the data collected in the year 2023 as the market capitalization as a (%) of GDP which is proxy for stock market development figure was still not available.

3.4 Data Collection Tool

The study was strictly tailored to time series data acquired from secondary sources. The data was also presented on a quarterly basis as provided in the (World bank database,2023), for variables such as stock market development and GDP.

3.5 Data Collection

Quarterly secondary data used for this study was collected for a 24-year period between 2000 to 2023. The data was collected quarterly from the CBK website containing quarterly exchange rates and inflation rates for every year. Inflation data was represented by CPI and GDP as proxy for economic growth data was collected from KNBS. The stock market development in Kenya data was obtained from the World bank database to measure market capitalization and liquidity. Data obtained from these sources was authentic and useful hence it can be used for conclusion as it details both dependent and independent variables for the study.

3.6 Data processing and Analysis

The research employed both descriptive and inferential statistical methodologies to analyze the time series data that was gathered. Due to the quantitative characteristics of the dataset, STATA version 12 was utilized for statistical analysis, owing to its effectiveness and user-friendly interface, particularly in the context of time series econometrics. This software enabled the execution of diagnostic assessments, correlation analyses, and regression modeling.

Descriptive statistics were calculated to encapsulate the principal attributes of the data, incorporating measures such as mean, maximum, minimum, standard deviation, variance, skewness, and kurtosis. These statistics provided a comprehensive overview of the distribution and variability of the variables under investigation. Correlation analysis was conducted to assess the strength and direction of the relationships between the dependent and independent variables. This helped to identify potential multicollinearity issues and the overall degree of association between variables prior to regression modeling.

Inferential statistics, particularly multivariate regression analysis, were employed to examine the relationship between the dependent variable stock market development and key macroeconomic indicators, namely exchange rates, interest rates, inflation rates, and gross domestic product (GDP).

Multiple linear regression was used to determine the extent to which variations in these independent variables explained changes in stock market development.

The regression model used was;

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \varepsilon_t$$

Y = stock market development represented by the market capitalization as a (%) of GDP.

$\beta_1\beta_2\beta_3\beta_4$ = slope of regression

X_1 = exchange rate measured by quarterly exchange rates between KSH/USD

X_2 = Interest rates measured by average quarterly lending rates

X_3 = Inflation rate measured by CPI on a quarterly basis

X_4 = GDP per capita on a quarterly basis

ε= Error term

Time series analysis conducted studies elements of data over a span of time to illuminate patterns, trends and relationships. The study sought to fit a Vector Autoregressive Model (VAR) or a Vector Error Correction Model (VECM) for data presentation and illustration. VAR is incorporated where multiple time series variables directly impact each other, exploring the joint

dynamics of study variables. Model elements are regressed on its own lagged values and other values lagged in the model to determine the value of such values and the crucial role such variables play. Meanwhile VECM, accounts for both short term deviations and long-term associations amid multiple elements in the time series. VECM focusses its attention to dealing with non-stationary time series data with its main focus being correction for any cointegration among study elements.

The VECM model would be fit in case of cointegration after ascertaining the time series variables are stationary. In case of the presence of no cointegration a VAR model would be fitted instead. To address the dynamic characteristics of the time series data, addressing of cointegration amongst study variables and to capture long-run equilibrium relationships among the variables, the study implemented the Vector Error Correction Model (VECM). Market capitalization as a percentage of GDP served as a proxy for stock market development. The VECM framework facilitated the consideration of potential cointegration among the variables, ensuring that both short-term dynamics and long-term relationships were effectively modeled. Each variable within the system was articulated as a linear function of its own past values and the past values of other variables, thereby allowing for a thorough analysis of the interconnections among the macroeconomic indicators and the stock market.

$$\text{Market Capitalization}_{t} = \alpha_1 + \sum_{i=1}^{n} \beta_i \, \text{Inflation}_{t\text{-}i} + \sum_{j=1}^{n} \gamma_j \, \text{Real Interest Rates}_{t\text{-}j} + \sum_{k=1}^{n} \delta_k \, \text{Exchange Rates}_{t\text{-}k} + \sum_{l=1}^{n} \theta_l \, \text{Gross Domestic Product}_{t\text{-}l} + \mu_{t1}$$

$$\text{Inflation}_{t} = \alpha_1 + \sum_{i=1}^{n} \beta_i \, \text{Market Capitalization}_{t\text{-}i} + \sum_{j=1}^{n} \gamma_j \, \text{Real Interest Rates}_{t\text{-}j} + \sum_{k=1}^{n} \delta_k \, \text{Exchange Rates}_{t\text{-}k} + \sum_{l=1}^{n} \theta_l \, \text{Gross Domestic Product}_{t\text{-}l} + \mu_{t2}$$

Real Interest Rates $_{t}$ = α_1 + $\sum_{i=1}^{n} \beta_i$ Market Capitalization $_{t-i}$ + $\sum_{j=1}^{n} \gamma_j$ Inflation $_{t-j}$ + $\sum_{k=1}^{n} \delta_k$ Exchange Rates $_{t-k}$ + $\sum_{l=1}^{n} \theta_l$ Gross Domestic Product $_{t-l}$ + μ_{t3}

Exchange Rates $_{t}$ = α_1 + $\sum_{i=1}^{n} \beta_i$ Market Capitalization $_{t-i}$ + $\sum_{j=1}^{n} \gamma_j$ Inflation $_{t-j}$ + $\sum_{k=1}^{n} \delta_k$ Real Interest Rates $_{t-k}$ + $\sum_{l=1}^{n} \theta_l$ Gross Domestic Product $_{t-l}$ + μ_{t4}

Gross Domestic Product $_{t}$ = α_1 + $\sum_{i=1}^{n} \beta_i$ Market Capitalization $_{t-i}$ + $\sum_{j=1}^{n} \gamma_j$ Inflation $_{t-j}$ + $\sum_{k=1}^{n} \delta_k$ Real Interest Rates $_{t-k}$ + $\sum_{l=1}^{n} \theta_l$ Exchange Rates $_{t-l}$ + μ_{t5}

3.7 Diagnostic Tests

Diagnostic tests were done to determine the assumptions of multiple linear regression, to test the quality of data used as well as guide in formulating the model that is most appropriate model to use. Relationship of variables appear linear but on further investigation a non-linear relationship can be observed. Tests are performed on the data to determine its validity included normality, linearity, homoscedasticity and multicollinearity due to its nature of being financial time series data.

3.7.1 Linearity test

Linearity tests show association amongst two variables X and Y being proportional and constant whereby a change in one variable by a certain amount causes the other variable to change by a predictable amount. Mathematically the equation is represented by Y= bX + c with C being the constant. Linearity was determined through a scatter plot or F-static in ANOVA.

3.7.2 Test for Normality

Normality is a statistical test used to determine if the dataset comes from a normal/ gaussian distribution. It tests the assumption that the residual of the variables is distributed around the mean. A bell curve is formed for t-test and ANOVA or provide a p-value. The statistical tests include Kolmogorov-Smirnov (K-S) test used for data sets ≥100 and the Shapiro-Wilk test used for small data sets. If any elements were not distributed normally, they were standardized or transformed through the log transformation method.

3.7.3 Cointegration test

Cointegration analysis was performed to investigate the existence of a long-term linear relationship among the variables included in the study. For such a relationship to be valid, the underlying stochastic processes must exhibit stationarity, as the linear statistical properties are only applicable under this condition. Apparent transient ends have a high serial correlation with the random error. In instances where the data displayed trends, detrending methods were employed to address non-stationarity and to more accurately capture the long-term associations among the variables. The Johansen cointegration test was utilized within a Vector Autoregressive (VAR) framework, particularly in scenarios where the time series variables were non-stationary at level but became stationary after first differencing. This test is well-suited for detecting cointegrated relationships and assessing long-run equilibrium dynamics among non-stationary variables

3.7.4 Test for homoscedasticity

Homoscedasticity assumes the variance of the error term is constant across all values of the independent variable. Absence of constant variance of the error term or residuals shows heteroscedasticity. To test for this the white test was conducted. Correlation coefficient describes the degree and magnitude to which the changes of one variable affect another variable. The rage

of coefficients is between +1.0 to -1.0 whereby, a correlation coefficient below zero shows that variables are moving in opposite directions and those above zero are moving in tandem. It was tested using the Pearsons correlation coefficient or the White's test.

3.7.5 Multicollinearity

Multicollinearity, a phenomenon that occurs when two or more independent variables exhibit moderate to high correlation, which was assessed through the use of correlation matrices and quantified via the Variance Inflation Factor (VIF) and tolerance values. A VIF exceeding 10 is generally considered indicative of problematic multicollinearity. When such cases were identified, the affected variables were either excluded or substituted with alternatives that displayed lower levels of collinearity to preserve the integrity of the regression estimates.

3.7.6 Autocorrelation

Autocorrelation also known as serial correlation refers to the degree of correlation between a variable and its own past values over successive time intervals. This phenomenon was assessed using the Durbin-Watson (DW) statistic. A DW value between 1.5 and 2.5 is typically interpreted as evidence of no significant serial correlation in the residuals. Where this assumption was violated, robust standard errors were applied to correct for any bias introduced by autocorrelation, ensuring the reliability of the regression results.

3.7.7 Granger Causality

The Granger causality test serves as a statistical instrument for evaluating whether one time series can yield significant predictive insights regarding another time series. Although it does not establish a definitive causal relationship, it facilitates the identification of predictive causality by

assessing whether the historical values of one variable (X) substantially improve the forecasting of another variable (Y), beyond the explanatory capacity of Y's own lagged values (Brooks, 2008). Essentially, the test evaluates the existence of a lead-lag relationship between two time series by identifying whether the inclusion of lagged values of X improves the explanatory power of a model for Y.

To ascertain the appropriate number of lags for the Granger causality analysis, lag selection criteria were employed. In this research, the Varsoc function in Stata was utilized to generate lag-order selection statistics for both Vector Autoregressive (VAR) and Vector Error Correction Models (VECM). The optimal lag length was established using three widely recognized information criteria: the Akaike Information Criterion (AIC), Schwarz's Bayesian Information Criterion (SBIC), and the Hannan and Quinn Information Criterion (HQIC) (Stata, 2023). These criteria are instrumental in ensuring that the model accurately captures the underlying dynamics without succumbing to overfitting.

CHAPTER FOUR

RESULTS AND FINDINGS

4.1 Introduction

This chapter analyzes the diagnostic test results of the data used using STATA 12 to determine the relationship between macroeconomic factors and stock market development. Quarterly secondary data of companies listed in Kenya's stock market was used which covered the period of 2000 to 2023. Data sources included the Nairobi Securities Exchange, KNBS, Central Bank of Kenya, and World Bank database. This chapter indicated the descriptive statistics analysis used, correlation tests, OLS regression analysis and diagnostic tests to determine the extent to which each variable significantly influences other variables in the study. The VECM findings were articulately interpreted and inadeptly discussed in the subsequent chapter.

4.2 Descriptive statistics

Descriptive statistical analysis was performed to summarize the central tendencies comprised of the mean, standard deviation, maximum and minimum value, skewness, variance and kurtosis as well as distributional characteristics of the macroeconomic indicators' association with stock market development in Kenya. Macroeconomic variables included in the study were; GDP, inflation, interest rates and exchange rates while stock market development was proxied by market capitalization as a (%) of GDP.

TABLE 2

Descriptive statistics

Stats	Stock Market Development	GDP	Inflation	Interest rate	Exchange rate
Mean	19.42187	4.575729	7.278021	5.91625	89.86948
Max	35.5	11.6	45.98	12.61	124.15
Min	9.28	-4.1	1.55	-10.58	66.79
Standard dev	5.440438	2.618008	5.064513	5.12247	16.19304
Variance	29.59837	6.853968	25.6493	26.2397	262.2146
Skewness	.34817	-.4851771	5.55008	-2.011632	.5120641
Kurtosis	3.478784	4.147954	39.89804	6.603223	2.024692
Cv	.2801191	.5721511	.6958641	.8658305	.180184

Among all variables, the exchange rate exhibited the highest mean value of 89.87, with a maximum of 124.15 and a minimum of 66.79. It also recorded the highest variance 262.2146 and a standard deviation of 16.1930, indicating substantial volatility in exchange rate movements over the period under analysis. The exchange rate exhibited a positive skewness of 0.5121, which implies a distribution characterized by an elongated right tail and the occurrence of extreme values at the upper end. Inflation showed a distinctly different pattern, with a highly positive skewness value of 5.5501, pointing to a significant number of high value outliers on the upper end of the distribution. This variable also exhibited the highest kurtosis at 39.90, suggesting a leptokurtic distribution far from normal characterized by a higher probability of extreme events. As noted by UCLA (2012), such high kurtosis values may signal greater risk exposure, particularly relevant in financial risk assessments. In contrast, other variables showed more normally distributed patterns, with relatively lower skewness and kurtosis values.

4.3 Regression Analysis

To investigate the impact of selected macroeconomic variables on stock market development in Kenya, a multiple regression analysis was conducted using stock market capitalization (as a percentage of GDP) as the dependent variable. The independent variables included GDP, inflation rate, real interest rate, and exchange rate. The analysis aimed to determine the extent to which fluctuations in these macroeconomic indicators influence stock market development over time represented in the table below.

Financial markets are influenced by a range of macroeconomic variables acting together. Multiple regression allows the study to control for each variable's effect while isolating the contribution of others. The regression analysis results provide some significant comprehension on key drivers of stock market development. GDP and real interest rates emerge as the key determinants, with GDP positively contributing to development of stock markets while real interest rates display a negative effect. This aligns with economic theory, where a growing economy with higher GDP boosts stock market performance, while higher real interest rates may dampen investment due to increased borrowing costs. Inflation and exchange rates, although theoretically important, do not show statistically significant effects in this model, potentially due to the time period, data limitations, or other unmeasured factors.

The constant in the regression model was statistically significant ($p = .000$), with a value of approximately 14.1. This suggests that in the absence of variation in the included macroeconomic variables, baseline stock market development remains at a substantial level, possibly due to structural or institutional factors not captured in the model.

The regression analysis indicated that GDP serves as a statistically significant positive predictor of stock market development. The coefficient for GDP was calculated at 0.785 ($p < .001$), suggesting that a one-unit increase in GDP corresponds to an approximate 0.785-unit increase in

stock market capitalization, while controlling for other variables. The t-statistic of 3.94, along with a 95% confidence interval that excludes zero, reinforces the robustness of this finding. Economically, this outcome aligns with theoretical expectations that posit a positive relationship between economic growth and the development of financial markets emphasizing that GDP plays a substantial role in driving development of stock markets. This could reflect that a growing economy positively influences the stock market development or related outcome measured by stock market development.

The inflation coefficient was negative (-0.144) but not statistically significant ($p = 0.205$). The confidence interval includes zero, suggesting that the true effect of inflation on stock market development could be negligible or highly variable. This finding implies that inflation, while economically relevant, did not exert a significant direct impact on the stock market during the study period. The lack of statistical significance may be attributed to data limitations or the influence of other unaccounted for variables.

The analysis revealed a statistically significant negative relationship between real interest rates and stock market development (coefficient = -0.259, $p = 0.017$). This finding implies that a one-unit increase in the real interest rate leads to a 0.259 unit decrease in stock market development, ceteris paribus. This result is consistent with economic theory, which asserts that higher borrowing costs can diminish investment and related economic activities. As the opportunity cost of holding stocks or securities increases when real interest rates rise thereby adversely affecting equity market performance. The confidence interval excludes zero, further validating the negative association. Therefore, real interest rates perform a critical role in addressing stock market development, and efforts to manage these rates could have significant implications for the stock market or similar metrics of financial performance.

The coefficient for the exchange rate was positive (0.048), suggesting a potential positive relationship between currency depreciation (assuming the exchange rate is defined as domestic currency per unit of foreign currency) and stock market development. However, this relationship was not statistically significant (p=0.188), and the confidence interval includes zero suggesting that the true effect of the exchange rate could be positive, negative, or non-existent. Consequently, while the direction of the coefficient aligns with expectations that a weaker currency may enhance market activity through increased exports the evidence is insufficient to establish a definitive effect.

Stock market development = 14.0985 + 0.78496*GDP - 0.14367*Inflation – 2.5889*Interest rates + 0.0479*Exchange rates

TABLE 3

Regression Analysis

smd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
gdp	.7849681	.1993694	3.94	0.000	.3889453	1.180991
inf	-.143666	.1125157	-1.28	0.205	-.3671647	.0798327
rir	-.2588909	.1064986	-2.43	0.017	-.4704373	-.0473445
exch	.047945	.0361086	1.33	0.188	-.0237803	.1196704
_cons	14.09855	3.004094	4.69	0.000	8.131283	20.06581

4.4 Diagnostic Tests

This section examines the tests of multiple linear regression assumption and data treatment in case of violation of the assumptions. The study used graphical model as well as the Shapiro-Wilk tests to test for normality, Breusch- pagan test to determine heteroskedasticity, Variance Inflation Factor

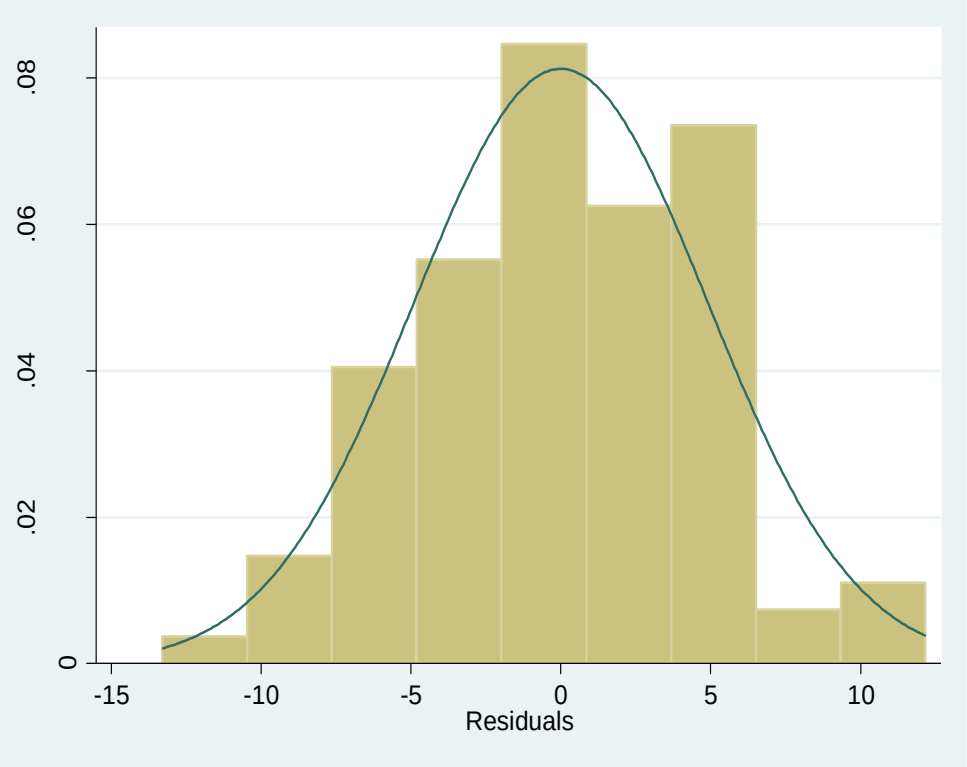
(VIF) to test for multicollinearity and lastly the Breusch- Geofrey test to determine serial correlation.

4.4.1 Normality Tests

Tests for normality were done using the predicted residuals to create a histogram. The Histogram depicted a normal distribution from the plotted residuals as shown in figure 3.

FIGURE 3:

Normality Test



The Shapiro-Wilk test were performed to assess the normality of the dataset. The obtained p-value of 0.69211 significantly surpasses the conventional significance levels of 0.05 and 0.01. This elevated p-value suggests incomprehensive evidence to reject the null hypothesis of normality, indicating that the residuals do not conform to a normal distribution. Consequently, the findings

from the Shapiro-Wilk test imply that the residuals of the model do not exhibit significant departures from normality.

TABLE 4

Shapiro-Wilk test

Shapiro-Wilk					
Variable	Obs	W	V	z	Prob>z
Residuals	96	0.99001	0.797	-0.502	0.69211

4.4 2 Heteroskedasticity

Heteroscedasticity refers to the phenomenon where the variance of errors is not constant, in contrast to homoscedasticity, which indicates a constant variance of errors. To examine this aspect, the Breusch-Pagan test was employed subsequent to the regression analysis of stock market development against GDP, inflation, real interest rates, and exchange rates. The results of the Breusch-Pagan/Cook-Weisberg test provide evidence of heteroscedasticity within the regression model, as evidenced by a p-value of 0.05. This finding suggests that the variance of the residuals is not uniform across observations. The test statistic of 7.87 is relatively high, further corroborating the conclusion that the variance of the residuals may not remain constant.

TABLE 5

Breusch Pagan Test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of stock market development
chi2(1) = 7.87
Prob > chi2 = 0.0050

4.4.3 Multicollinearity

Multicollinearity is defined by a significant degree of intercorrelation among two or more independent variables within a multiple regression context. The study implemented the use of VIF to determine the degree of multicollinearity. VIF enhances the verification of severity on multicollinearity issues to adjust the model. It quantifies the extent to which the variance of an independent variable is influenced by other independent variables. If VIF value is greater than 10 it shows a high multicollinearity while less than 10 shows no multicollinearity. The findings of the study revealed a VIF that clearly indicates no multicollinearity among the variables.

TABLE 6

Variance Inflation Factor

Variable	VIF	1/VIF
Exchange rate	1.29	0.774483
Inflation	1.23	0.815435
Real Interest rate	1.12	0.889702
GDP	1.03	0.971924
Mean VIF	1.17	

4.4.4 Autocorrelation

Autocorrelation shows the degree of similarity between a given time series and a lagged version of itself over successive time intervals. This test is employed to determine the absence of correlation between the error term and independent variables, as well as to confirm that the error terms are not correlated with one another over successive time intervals. The Breusch-Godfrey test was utilized in this study to evaluate this assumption, and the results indicated a chi-squared value

of 0.0000, which is below the 5% significance threshold. Therefore, we can accept the alternative hypothesis, concluding that the study does not exhibit any serial autocorrelation.

TABLE 7

Breusch-Godfrey LM test for autocorrelation

	Breusch-Godfrey Test		
lags(p)	chi2	df	Prob > chi2
1	61.202	1	0.0000
	H0: no serial correlation		

4.5 Time Series Analysis

Time series analysis is used to evaluate a sequence of data points collected at specific intervals over time by inspecting how variables change over time. The study variables are time series in nature hence time series analysis was used to determine the association between macroeconomic variables and stock market development in Kenya. This analysis was conducted after the data was tested for OLS multiple regression assumptions. Various tests conducted included the stationarity test, lag length selection and the cointegration test. The VECM model would be fit in case of cointegration after ascertaining the time series variables are stationary. In case of the presence of no cointegration a VAR model would be fitted instead. The Granger causality test, Impulse Response Function and Forecast Error Variance Decomposition were finally conducted to gain insight into the complex variable's relationship.

4.5.1 Stationarity Test

To test for stationarity empirically between the variables the study incorporated the Dickey Fuller (DF) test. Decision criteria is determined on the presence of stationarity if the absolute value is greater than the critical value and $p< 0.05$. The hypothesis of the study include;

H_0 Prescence of non-stationarity among study variables

H_1 Prescence of stationarity among study variables

The study results proved that GDP was characterized with stationary at level basis while inflation, interest rates, exchange rates and stock market development achieved stationarity at their first difference.

TABLE 8

Stationarity Tests

	At Level			**At 1st Diff**		
	t-statistic	5% CV	Sig	t-statistic	5% CV	Sig
Stock Market Dev	-2.631	-2.894	0.0868	-11.208	-2.895	0.0000
GDP	-4.858	-2.894	0.0000			
Inflation	0.094	-2.894	0.9656	-7.674	-2.895	0.0000
Interest rates	-3.636	-2.894	0.0051	-9.647	-2.895	0.0000
Exchange Rates	0.716	-2.894	0.9902	-10.720	-2.895	0.0000

4.5.2 Lag length Selection Criteria

The criteria used to select the optimal lag length is measured through the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), Schwarz Information Criterion (SIC), LR test statistic, Final predictor error (FPE) and the Hannan-Quinn Information Criterion (HQIC). The

decision criterion to choose the optimal lag, the lowest value is considered to be the best for the model. According to the study results FPE and AIC lag 4 has the lowest value which makes lag 4 the optimal model.

TABLE 9

Lag length Selection

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	1134.3				51544.7	25.0396	25.0952*	25.1775*
1	1106.32	55.97	25	0.000	48317.8	24.974	25.3079	25.8017
2	1085.29	42.054	25	0.018	52990	25.0613	25.6735	26.5789
3	1073.8	22.97	25	0.579	72215.6	25.3583	26.2489	27.5657
4	1021.73	104.16*	25	0.000	40788.2*	24.7632*	25.932	27.6604

4.5.3 Johansen Cointegration

Cointegration is a statistical test used to determine relationships amongst any variables in the long-term basis. Johansen test is hence a statistical test used to determine the number of cointegrating relationships among a group of non-stationary time series variables (Amalendu,2012). The hypothesis used in the study states;

$H_{0:}$ Prescence of no cointegration between variables

H_1: Prescence of cointegration between variables

The presence of no cointegration deems the fitting of a VAR model as opposed to a VECM model which is normally fitted whenever there is cointegration. The decision criteria occurs when the trace statistic is greater than the critical value there is presence of cointegration as shown in the study hence rejecting the null hypothesis. Study results depict the presence of five cointegrating equations therefore the Vector Error Correction method is fit for the study.

TABLE 10

Johansen Cointegration Test

Johansen tests for cointegration

Trend: constant — Number of obs = 93

Sample: 2000q4 - 2023q4 — Lags = 2

max rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	30	-1201.3167	.	193.6157	68.52
1	39	-1171.5592	0.47268	134.1009	47.21
2	46	-1147.3125	0.40633	85.6073	29.68
3	51	-1128.6551	0.33051	48.2926	15.41
4	54	-1113.2307	0.28230	17.4438	3.76
5	55	-1104.5088	0.17103		

4.5.4 Vector Error Correction Model (VECM)

The Vector Error Correction Model (VECM) is employed to analyze the relationship between multiple cointegrated time series variables, capturing both short-term dynamics and long-term equilibrium relationships. In this study, the results show four cointegration equations which prompted the need to plot a VECM model is used to understand the relationship between macroeconomic variables (GDP, inflation, interest rate, and exchange rate) and stock market development (measured by market capitalization) in Kenya from 2000 to 2023 on a quarterly basis. The VECM model also depicted the deviation of variables in the short run caused by impulses in the Kenyan economy.

The long run cointegrating relationship among variables is determined by the cointegrating equation while short run dynamics are captured through the differenced variables and the key coefficients. The Error Correction Term (ECT) determine the speed that variables can achieve an equilibrium state after an impulse while the lagged difference capture the short-term effects of changes occurring in a variable. Results of the VECM model one is part of the VECM model and it reveals that there is absence of long run causality of stock market development at 10% as the p value = 0.718. Short run effects are also not significant in stock market development.

TABLE 11

VEC Model (1)

	Coef.	**Std. Err.**	**z**	**P>z**	**95% Conf**	**Interval**
D_dsmd _ce1						
L1. dsmd	-.6320887	.1370672	-4.61	0.000	-.9007355	-.3634419
LD. gdp	-.233832	.1044944	-2.24	0.025	-.4386372	-.0290268
LD. dinf	.0473198	.1319998	0.36	0.720	-.2113951	.3060348
LD. drir	.3379648	.1017923	3.32	0.001	.1384556	.537474
LD. dexch	.1692218	.0658985	2.57	0.010	.0400632	.2983804
LD.	.0708247	.0981976	0.72	0.471	-.1216391	.2632885
_cons	-.1092108	.3029279	-0.36	0.718	-.7029386	.484517
D_gdp _ce1	**Coef.**	**Std. Err**	**z**	**P>z**	**95% Conf**	**Interval**
L1. dsmd	.3436698	.1034391	3.32	0.001	.1409328	.5464068
LD. gdp	-.2094214	.0788577	-2.66	0.008	-.3639798	-.0548631
LD. dinf	-.1497333	.099615	-1.50	0.133	-.3449752	.0455085
LD. drir	-.2634441	.0768186	-3.43	0.001	-.4140058	-.1128825

LD. dexch	-.0054601	.0497309	-0.11	0.913	-.102931	.0920107
LD.	-.0101385	.0741058	-0.14	0.891	-.1553832	.1351062
_cons	.1281264	.2286076	0.56	0.575	-.3199363	.576189
D_dinf						
_ce1	**Coeff**	**Std. Err**	**z**	**P>z**	**95% Conf**	**Interval**
L1. dsmd	-.6646799	.2114881	-3.14	0.002	-1.079189	-.2501707
LD. gdp	.3330458	.1612298	2.07	0.039	.0170411	.6490505
LD. dinf	-.0155957	.2036695	-0.08	0.939	-.4147806	.3835891
LD. drir	-.0635923	.1570606	-0.40	0.686	-.3714255	.2442408
LD. dexch	.1051379	.1016782	1.03	0.301	-.0941477	.3044235
LD.	.1910363	.1515142	1.26	0.207	-.1059262	.4879987
_cons	.1940776	.4674033	0.42	0.678	-.7220161	1.110171
D_drir						
_ce1	**Coeff.**	**Std. Err**	**z**	**P>z**	**95% Conf**	**Interval**
L1. dsmd	-.1915673	.2096047	-0.91	0.361	-.602385	.2192504
LD. gdp	-.0186199	.159794	-0.12	0.907	-.3318104	.2945706
LD. dinf	-.3189209	.2018557	-1.58	0.114	-.7145508	.0767089
LD. drir	.1882698	.1556619	1.21	0.226	-.1168219	.4933616
LD. dexch	-.4343412	.1007727	-4.31	0.000	-.631852	-.2368304
LD.	.3024105	.1501649	2.01	0.044	.0080927	.5967283
_cons	-.039582	.4632408	-0.09	0.932	-.9475173	.8683533
D_dexch						
_ce1	**Coeff**	**Std. Err**	**z**	**P>z**	**95% Conf**	**Interval**
L1. dsmd	-.2063974	.1241048	-1.66	0.096	-.4496383	.0368435
LD. gdp	.196537	.0946124	2.08	0.038	.0111001	.3819738
LD. dinf	.1920586	.1195166	1.61	0.108	-.0421897	.4263069
LD. drir	.0868717	.0921658	0.94	0.346	-.0937699	.2675134
LD.	-.001747	.0596665	-0.03	0.977	-.1186911	.1151971

dexch						
LD.	-.5866875	.0889111	-6.60	0.000	-.76095	-.412425
_cons	-.0404694	.2742801	-0.15	0.883	-.5780485	.4971096

The consequent table predicts the variables being statistically significant as the p-value<0.05. The estimated coefficients are necessary for determination of equilibrium in the long term. These Error Correction Term (ECT) coefficients indicate the adjustment speed to the equilibriums achieved in the long term. ECT coefficients that are negatively depicted explain how deviations are being corrected in the model from the equilibrium determined in the long term. The cointegrating equation represents the long-term relationship among the variables;

Based on the coefficients provided, the VECM equations for each of the variables include:

D (Stock market development) = −0.6321·L1(ce1) − 0.2338·LD (Stock market development) + 0.0473·LD (GDP) + 0.3380·LD (Inflation) + 0.1692·LD (Interest rates) + 0.0708·LD (Exchange rates) − 0.1092

The error correction term shows the adjustment speed towards the long-term equilibrium, with a significant negative coefficient indicating that stock market development adjusts towards the equilibrium by 63.21% each period. The short-run dynamics show that stock market development is significantly affected by its past values and inflation rate, but the impact of GDP, real interest rates, and exchange rates are statistically insignificant.

D (GDP) = 0.3437·L1(ce1) − 0.2094·LD (Stock Market Development) − 0.1497·LD (GDP) − 0.2634·LD (Inflation) − 0.0055·LD (Interest rates) − 0.0101·LD (Exchange rates) + 0.1281

The error correction term is positive and significant, indicating that GDP adjusts towards the equilibrium by 34.37%. The short-term dynamics show a significant negative relationship between

past stock market development and GDP, indicating that as stock market development increases, GDP growth decreases in the short term. Inflation also significantly affects GDP negatively, but other variables are insignificant.

D (Inflation) = −0.6647·L1(ce1) + 0.3330·LD (Stock market development) − 0.0156·LD (GDP) − 0.0636·LD (Inflation) + 0.1051·LD (Interest rates) + 0.1910·LD (Exchange rates) + 0.1941

The error correction term is negative and significant, indicating that inflation adjusts towards the equilibrium by 66.47%. In the short term, stock market development has a positive and significant impact on inflation. Real interest rates and exchange rates positively influence inflation, although their effects are not statistically significant.

D (Interest rates) = −0.1916·L1(ce1) −0.0186·LD (Stock market development) − 0.3189·LD (GDP) + 0.1883·LD (Inflation) − 0.4343·LD (Interest rates) + 0.3024·LD (Exchange rates) − 0.0396

The error correction term is insignificant, indicating that real interest rates do not adjust towards long-term equilibrium as quickly. However, in the short run, real interest rates are significantly negatively influenced by past real interest rates and positively influenced by exchange rates.

D (Exchange rates) = −0.2064·L1(ce1) + 0.1965·LD (Stock market development) + 0.1921·LD (GDP) + 0.0869·LD (Inflation) − 0.0017·LD (Interest rates) − 0.5867·LD (Exchange rates) − 0.0405

The error correction term is negative and marginally significant, indicating that exchange rates adjust towards equilibrium. In the short term, exchange rates are significantly influenced by their own past values and stock market development, suggesting that changes in stock market

performance and prior exchange rate movements are key drivers of short-term exchange rate fluctuations.

TABLE 12

VECM Model (6)

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
_ce1						
dsmd	1	.	.	.	.	
gdp	-.3527358	.1112906	-3.17	0.002	-.5708613	-.1346102
dinf	.8910847	.1762792	5.05	0.000	.5455839	1.236585
drir	.3357167	.1014125	3.31	0.001	.1369519	.5344815
dexch	.4228501	.1719375	2.46	0.014	.0858588	.7598415
_cons	1.120781	.	.	.	.	.

4.6 Post Estimation Analysis

Post-estimation analysis involves examining the results of a statistical model to assess its fit, validity, stability and implications modelling the relationship between macroeconomic factors and stock market development in Kenya. The study tested for autocorrelation by use of Lagrange multiplier test on the residuals of the VEC Model. Tests for stability and Impulse response functions were conducted consequently. Once the VEC Model has been plotted the variables of the study should attain stationarity.

4.6.1 Test for Autocorrelation

The LaGrange multiplier test statistic was employed in the study and the results showed a lack of autocorrelation hence accepting the null hypothesis as the p value >0.05 as shown in Table 13

TABLE 13

Lagrange Multiplier Test

Lagrange-multiplier test			
lag	chi2	df	Prob > chi2
1	59.6964	25	0.00012
2	59.8203	25	0.00011

H0: no autocorrelation at lag order

4.6.2 Normality Test

The study performed the Jarque – Bera test to confirm if the residuals of the variables were normally distributed or not. The results depicted a normal distribution hence we accept the null hypothesis that the residuals are normally distributed.

TABLE 14

Test of Normality

	Jarque-Bera test		
Equation	chi2	df	Prob > chi2
D_dsmd	141.656	2	0.00000
D_gdp	15.900	2	0.00035
D_dinf	2052.486	2	0.00000
D_drir	389.311	2	0.00000
D_dexch	18.639	2	0.00009
ALL	2617.992	10	0.00000

4.6.3 Test for Variance Stability

Stability of a model is characterized with its equations being at equilibrium or returning back to equilibrium after a disturbance. Stable VECM models implies that the variables even if temporarily deviated due to impulses revert back to a long run equilibrium over a period of time. The study results indicate stability of the model as the eigen values lie inside the unit circle with a <1 modulus.

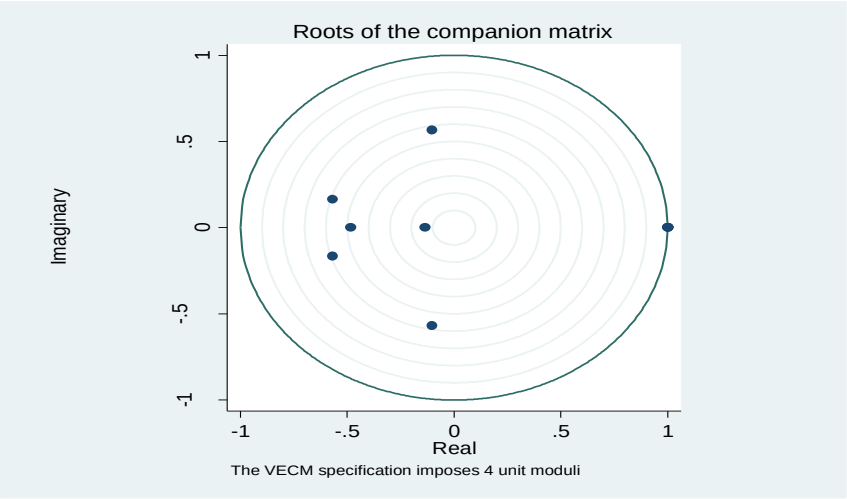
TABLE 15

Variance stability test

Eigenvalue stability condition	
Eigenvalue	Modulus
1	1
1	1
1	1
1	1
-.5687455 + .1638708i	.591883
-.5687455 - .1638708i	.591883
-.1027034 + .5681822i	.57739
-.1027034 - .5681822i	.57739
-.485024	.485024
-.1374515	.137451
The VECM specification imposes 4 unit moduli	

FIGURE 4

Variance Stability



4.6.4 Impulse Response Function

IRF statistical tool is used to analyze the dynamic shock impact of a variable on itself and other variables in the study over a specified time horizon. It traces the effect of shock propagations on a variable on the current and future values of the variable over time through the entire model. The study illustrates how the Kenyan stock market development responds to impulses of macroeconomic factors. The results from the study exhibit varying degrees of sensitivity to shocks from different macroeconomic factors.

Exchange rate shocks represented by the first column shows how other variables respond to a shock in the exchange rate. It appears that most variables have a small but noticeable downward trend after an initial shock, indicating that a shock to the exchange rate tends to negatively impact the other variables.

Inflation shocks as shown in the second column, whereby shocks to inflation seem to produce more varied responses, with some variables like stock market development showing a significant negative response.

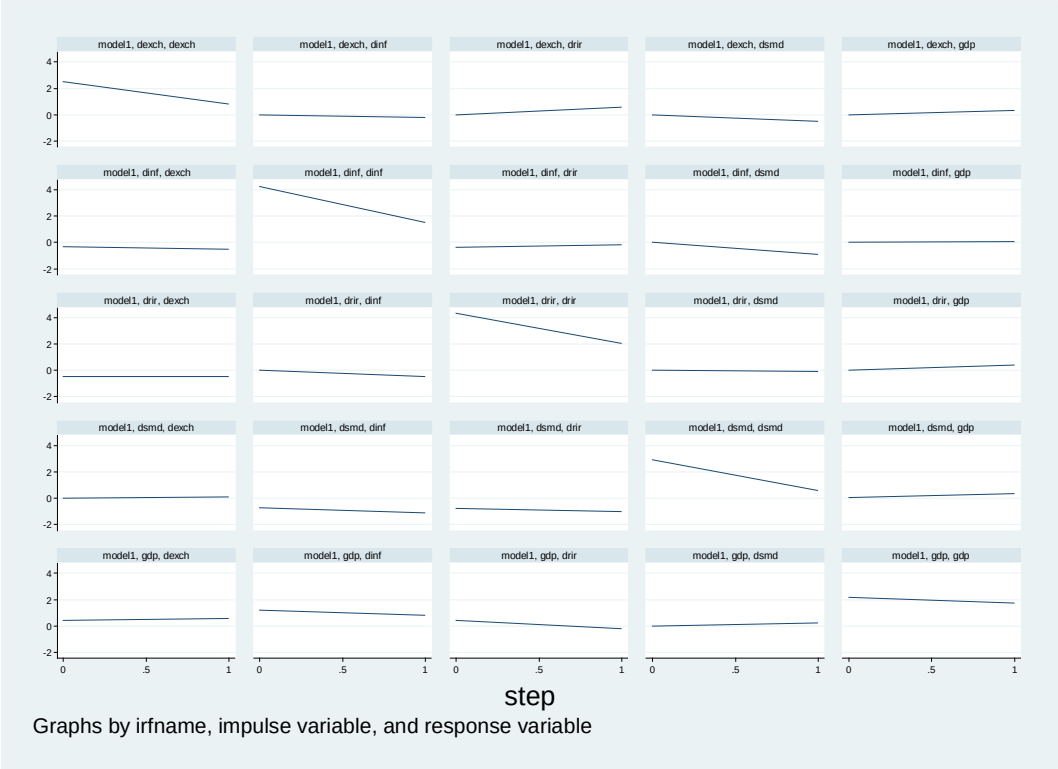
Interest rate shocks depicted in the third column shows the response to shocks in the interest rate, and many of the responses appear flat or only slightly negative, indicating minimal response to an interest rate shock.

Stock market development shocks in the fourth column, explain how most variables exhibit a downward response to a shock in itself, indicating a contractionary effect.

GDP shocks in the last column suggests that GDP shocks lead to slight positive responses in many variables, especially exchange rates, indicating a positive feedback loop when GDP increases.

FIGURE 5

Impulse Response Function



4.6.5 Variance Decomposition

Forecast Error Variance Decomposition quantifies the contribution of each innovation to the forecast error variance of each variable in the study at different time horizons attributed to shocks of itself and other variables under study.

The results of the study suggest that Exchange Rate Shocks in the first column, most variables like exchange rates, interest rates, and GDP show a consistent or increasing contribution to the forecast error variance. For instance, the first graph exchange rate shock to its own variance shows a strong upward trend, suggesting that most of the variance in the exchange rate is explained by its own shocks. Inflation and stock market development show limited impact from exchange rate shocks over the given time horizon.

Inflation Shocks in the second column, found that inflation shocks seem to explain a significant portion of their own variance seen in the second graph of the second column. However, inflation does not appear to significantly affect the variance of other variables, as most of the other lines remain near zero.

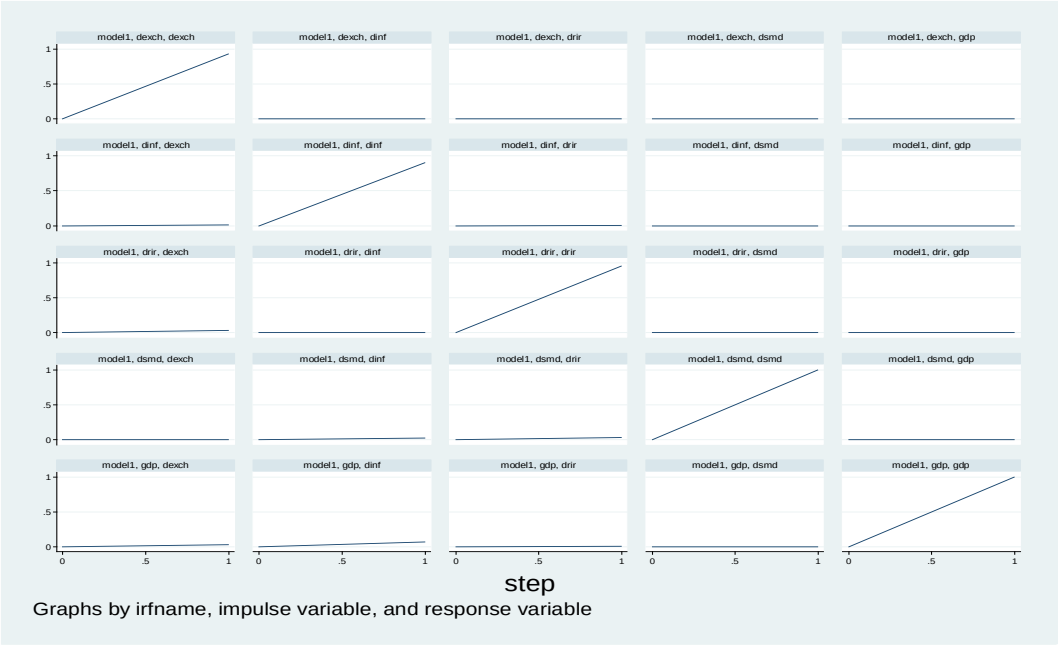
Interest Rate Shocks from the third column shows how much variance in the variables is explained by interest rate shocks. Most variables such as exchange rate and inflation exhibit a flat line, indicating a limited contribution from interest rate shocks, except for the interest rate itself which sees a moderate increase.

Stock market development shocks represented by the fourth column shows that the variable itself explains a moderate portion of its own forecast error variance but has limited impact on other variables.

GDP Shocks in the last column reveals that GDP shocks explain a growing portion of their own variance, but have limited influence on other variables. GDP's own forecast error variance increases sharply over time, suggesting that GDP shocks primarily affect GDP itself.

FIGURE 6

Factor Error Variance Decomposition



4.7 Discussion

The study sought to explore both in literature and methodology the relationship between macroeconomic variables and stock market development in Kenya addressing research gaps performed by previous scholars and researchers. The studies are described with different measures yielding to varied findings and conclusions therefore this section delved into other studies conducted on the subsequent topic as well as our study results.

4.7.1 Gross Domestic Product (GDP) and Stock market development

Examination of the relationship between Gross Domestic Product (GDP) and stock market development in Kenya was among the primary objectives of the study. Results from the multiple regression analysis yielded a positive and statistically significant coefficient of 0.78497, indicating that GDP exerts a vital role on stock market development. Specifically, a one unit increase in GDP

corresponds to an approximate 0.785-unit increase in stock market development, all else being equal. This finding is consistent with economic theory, which posits that economic expansion fosters corporate earnings, bolsters investor confidence, and enhances overall stock market performance.

However, the Vector Error Correction Model (VECM) produced a negative but statistically significant coefficient for GDP. This outcome implies that while GDP positively influences stock market development in the short run, deviations from the long-run equilibrium relationship are corrected over time. The negative coefficient signifies that when the system is above its equilibrium level, adjustment mechanisms are triggered in the subsequent periods to restore equilibrium. Although the short-run impact of GDP appears strong and positive, the long-run dynamics suggest a more complex interaction possibly due to structural economic shifts or diversion of capital into non-equity markets. Moreover, GDP also demonstrated notable short-run effects on other macroeconomic variables, such as stock market capitalization and inflation.

These findings support the hypothesis that GDP influences stock market development and are consistent with prior studies. For example, Osakure and Ananwud (2017), using time-series data from 1981 to 2015 and applying Granger Causality and ARDL models, found both short- and long-term positive relationships between GDP and market development. Similarly, Nafees et al. (2016) concluded that GDP and money supply positively influence stock market indices in their analysis of quarterly data from 2000 to 2015.

Consistent results were observed in other developing economies. Kolapo, Oke, and Olaniyan (2018) found GDP and money supply to significantly impact stock market capitalization in Nigeria between 1986 and 2015. Comparable results were also found by Hye, Mustafa, and

Mahmood (2010) in Bangladesh, who reported a robust positive correlation between GDP and stock market indices.

Nevertheless, not all studies align. Jonathan (2018), examining the Zimbabwean stock market, found a positive but statistically insignificant association in the long term. Banda (2017), using VECM and Granger causality tests on South African data (1995Q3–2015Q2), reported no significant relationship between GDP and the industrial index. Similarly, Worlu and Omodero (2017) found diverse results across several African economies: GDP had a negative influence in Nigeria and Ghana and depicted no significant relationship with stock market performance in Kenya and South Africa.

In Kenya, Kirui et al., (2014) also reported no key effect of GDP on stock market development using a TGARCH model and data from 2000 to 2012. These conflicting findings emphasize the importance of context-specific analysis, as economic structure, financial system maturity, and investor behavior may vary across countries and time periods.

Despite the differing short- and long-term dynamics, this study confirms the presence of a long run equilibrium relationship between GDP and stock market development in Kenya. This aligns with findings from other emerging markets, although variations across countries are evident. The observed contradictions such as a significant short-run effect but a correcting long-run trend may reflect structural transformations in the economy, changing investor preferences, or increased capital flows into non-equity investment avenues over time.

4.7.2 Inflation and Stock market development

The secondary aim of this study was to analyze the relationship between inflation and stock market development in Kenya. Findings of the multiple regression analysis produced a negative

coefficient of -0.143666, which, although statistically insignificant, indicates an inverse relationship. This suggests that rising inflation rates are generally associated with lower stock market development, a finding that aligns with the theoretical view that inflation erodes real purchasing power, discourages investment, and increases uncertainty (Oladosu & Topbie, 2022).

In contrast, the Vector Error Correction Model (VECM) analysis indicated a positive and statistically significant short-term relationship between inflation and stock market development. This suggest that in the immediate term, inflation may stimulate market activity, likely due to nominal increases in prices and returns. While inflation can erode real investment value in the long term, it may initially inflate stock prices, especially in inflation-sensitive sectors or during periods of speculative behavior.

These findings mirror those done by Oladosu and Topbie (2022), using monthly data from 2000 to 2019 in Nigeria, who observed a negative but insignificant effect of inflation on market capitalization. Likewise, Ramadhani (2018) noted that inflation exerted a minimal influence on stock returns, especially in the banking sector. VECM results in this study are further supported by Esau and Albert (2018), who reported a positive but statistically insignificant relationship between inflation and market development in Namibia indicating that while inflation may enhance short-term market dynamics, its long-term impact remains ambiguous.

Jonathan (2018) observed a similar result whereby inflation was demonstrated to exert a positive short-term effect on Zimbabwe's security's market, although the long-term impact was negligible. Notably, a unidirectional causality from market development to inflation was observed, echoing the short-run dynamics uncovered in this study. Ouma et al. (2014) used OLS to assess the relationship between macroeconomic variables and stock returns, also noting a significant short-run positive link between inflation and market returns.

Conversely, Eldomiaty et al. (2020), examining U.S. firms listed on the DJIA30 and NASDAQ 100 between 1999 and 2016, reported a strong negative relationship, asserting that inflation Granger-causes variations in stock prices. Similar outcomes were found in Ramzan (2016) using Pakistani data, where inflation significantly and negatively influenced stock market returns. Both studies advocated for inflation-targeted monetary policies to protect investor confidence.

Falahati et al., (2012), in their investigation of Iran's equity market employing a threshold regression model, found no significant effect of inflation on stock market development, illustrating that the inflationary stock market nexus may not always follow a linear pattern. Mutuku and Kimani (2013), in a local study based on NASI, observed a significant negative relationship, diverging from this study's VECM results but aligning with the regression analysis.

In summary, while the regression model points to a negative, statistically insignificant affiliation amid inflation and stock market development, the VECM model reveals a positive and significant short-run dynamic. These contrasting results reflect the dual nature of inflation's impact: detrimental in the long term due to erosion of real returns, yet potentially stimulative in the short term due to nominal price effects. The disparity among findings in both local and international literature highlights the complexity of this relationship and underscores the need for macroeconomic analysis that distinguishes between short-run dynamics and long-term structural effects in macro-financial analysis.

4.7.3 Interest rates and Stock market development

Evaluating the correlation between interest rates and stock market development in Kenya was the study's third objective. Outcomes of the regression analysis displayed a negative and statistically

relevant coefficient of -0.470437 (p = 0.017), indicating that a one-unit rise in interest rates corresponds to a decline in market capitalization and, consequently, stock market development. This finding confirms the inverse relationship commonly posited in financial literature, whereby higher interest rates raise borrowing costs, reduce investment, and discourage equity market participation, thus impeding market growth.

Interestingly, the Vector Error Correction Model (VECM) yielded a positive and statistically significant correlation between interest rates and stock market development in the short run. This finding suggests that while rising interest rates typically constrain economic activity, they may temporarily attract capital into interest-bearing assets, boosting market participation in the short term. Such a result may reflect investor responses to attractive savings instruments or bond yields in a high-interest environment. Over time, however, sustained high rates are likely to exert contractionary effects on investment and consumption, potentially undermining stock market performance.

The regression findings are consistent with numerous empirical studies. Nurul Siti (2024), examining data from 2019 to 2023, reported that higher interest rates increased corporate borrowing costs, reduced profitability, and diminished investor appetite for equities findings consistent with this study's negative regression coefficient. Similarly, Sergi et al. (2021) emphasized that interest rate hikes lead to declining stock returns, whereas rate reductions tend to stimulate equity markets.

Baloch (2020), in his study of the Karachi Stock Exchange, confirmed that elevated interest rates suppress market returns by increasing lending costs and reducing corporate earnings. Likewise, Rachmawati (2019) and Mwangi and Wekesa (2017) noted statistically significant

and adverse effects of interest rates on share prices and overall market advancement in Indonesia and Kenya, respectively.

Conversely, in the short-term positive relationship captured by the VECM model aligns with findings by Eldomiaty et al. (2019) and Benakovic and Posedel (2013), who observed that interest rates, when employed as monetary policy tools, could momentarily stabilize or even invigorate financial markets manage inflation and attract capital. In Kenya, Olweny and Omondi (2011) similarly found a significant long-term influence of interest rates on stock indices using EGARCH models, supporting the relevance of monetary policy in shaping market behavior.

However, not all findings are congruent. Omodero and Mlanga (2019) and John (2019) reported no statistically significant impact of interest rates on Nigerian stock markets. Additionally, Jonathan (2018) found a positive but insignificant relationship in both short and long terms, suggesting that the interest rate-stock market dynamic may differ depending on market structure, investor behavior, and the efficiency of monetary transmission mechanisms.

This finding suggests that in the short term, higher interest rates may attract capital into interest-bearing financial instruments, potentially stimulating temporary investor activity in related market segments. Such behavior may arise when high returns on savings or fixed-income securities lead to capital inflows into the broader financial system, including the stock market. These results demonstrate a dual dynamic: while elevated interest rates generally hinder growth in the stock and equities market over an extended timeframe due to higher financing expenses and reduced investment they may briefly stimulate market activity in the short run by converting capital into interest bearing securities and instruments. This highlights the nuanced role of monetary policy in financial market performance and the importance of considering both immediate and delayed responses to interest rate changes.

4.7.4 Exchange rates and Stock market development

Exploring the connection between exchange rates and stock market development in Kenya was the fourth aim in the study. Regression analysis produced a positive but statistically insignificant coefficient of 0.047945, indicating that a rise in exchange rates may be associated with minor improvements in stock market development. The VECM results mirrored this finding, also showing a positive yet insignificant short run relationship.

These findings imply that exchange rate movements particularly depreciation of the domestic currency may benefit export-oriented companies and boost market performance. However, the statistical insignificance suggests that exchange rate fluctuations alone do not meaningfully drive stock market development in Kenya, especially in the short term.

Comparable findings have been drawn in prior research. Khan et al., (2019), in a study of the Shenzhen Stock Exchange, identified a significant negative link between exchange rates and stock returns, concluding that the appreciation of the Chinese yuan adversely affects equity prices. Delgado et al. (2018) also found that a rising exchange rate negatively impacted Mexico's stock market index. These studies support the notion that a stronger currency can suppress corporate earnings and investor returns.

Najaf and Najaf (2016) denoted a similar negative association amidst the Indian rupee/USD exchange rate and Nifty returns, underscoring how exchange rate volatility impairs profitability and discourages foreign investment findings that align partially with this study's insignificant relationship.

Conversely, some research reports a positive relationship. Shoko and Dumisile (2018) found significant positive effects of exchange rates on the Zimbabwean stock market in both the

short and long term, with bidirectional causality confirmed. Sichoongwe (2016), however, reported that exchange rate volatility discouraged investor participation in Zambia, highlighting the mixed nature of these impacts across contexts.

Locally, Ndunda (2016) reported a weak negative correlation between exchange rates and stock market performance in Kenya. Nyaga (2014) also observed exchange rate volatility adversely affected stock prices in firms listed on the NSE, though the study's short time frame limited generalizability. Tsai (2012), analyzing six Southeast Asian markets, confirmed that exchange rate-stock market relationships become more pronounced during periods of financial stress.

Some contrasting findings exist. Ling, Fayman, and Michael (2014) found that U.S. banks benefit from dollar appreciation. Wu et al., (2012), studying the Philippines, found that while a long-term relationship existed between the exchange rate and stock index, the short-term impact was statistically insignificant. Hsing (2011) observed that appreciation of the Bulgarian lev improved stock market performance.

Studies in Nigeria reveal similarly mixed outcomes. Olugbenga (2012) found that while exchange rates had a positive short-term effect on market dynamics, they exerted negative long-term impacts on stock market development. This dual relationship reflects how exchange rate volatility may temporarily enhance market activity but pose long-term risks due to macroeconomic instability or uncertainty in monetary policy. Mugambi and Koech (2016) also reported significant exchange rate effects on NSE-listed banks, while Sifunjo and Mwasaru (2012) documented a causal link between exchange rate changes and stock price determination in Kenya, though their findings suggested stronger influence of stock markets on exchange rates, rather than the reverse.

These findings suggest that while exchange rate depreciation can support some export-oriented companies, the overall development of the stock market is influenced by a broader set of economic and institutional factors. The insignificance of the relationship may be due to limited foreign investor participation, underdeveloped hedging mechanisms, or weak transmission of exchange rate effects into equity market performance. The results align with several empirical studies that report **inconsistent or weak correlations** between exchange rates and stock market outcomes. However, they contrast with other findings especially in export-driven economies—where exchange rate volatility has been shown to significantly impact investor sentiment and market performance. These mixed outcomes highlight the need for market-specific analysis when assessing the role of movements of exchange rates in stock market development.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this section a generalized summary of the study were addressed, the conclusions derived as well as provide recommendations derived from the relationship of macroeconomic factors and stock market development in Kenya. The results provide insightful information regarding the influence of these variables to stock market development.

5.2 Summary of study findings

The first objective sought to examine the impact of GDP on stock market development. The regression results revealed a positive and statistically significant coefficient of 0.785 ($p = 0.000$), indicating that economic growth plays a vital role in fostering stock market development in Kenya. This finding aligns with theoretical expectations that increased GDP contributes to corporate profitability, investor confidence, and equity market expansion. However, results from the VECM model showed a coefficient of 0.047 ($p = 0.720$), suggesting that GDP does not have a statistically significant short-term effect on stock market development. This divergence may be attributed to Kenya's economic structure, where a substantial portion of activity occurs in sectors such as agriculture, informal businesses, or state-owned enterprises, which are not publicly listed and thus not directly reflected in the stock market.

The second objective assessed the relationship between inflation and stock market development. According to the regression analysis, the coefficient for inflation was negative (-0.144) and statistically insignificant ($p = 0.205$). This implies that inflation did not exert a

significant influence on long-term stock market development during the study period. Conversely, the VECM analysis indicated a positive and statistically significant short-term relationship, with a coefficient of 0.338 (p = 0.001). This suggests that rising inflation may stimulate short-term stock market activity possibly due to increased nominal asset prices or investor behavior influenced by inflation expectations. In such contexts, inflation may temporarily boost market values and corporate earnings, attracting speculative investment.

The third objective focused on understanding the effect of interest rates. The regression results demonstrated a negative and statistically significant coefficient of -0.259 (p = 0.017), implying that rising interest rates reduce stock market development. This is consistent with economic theory, where higher interest rates raise borrowing costs, deter investment, and reduce corporate profitability factors that collectively hinder equity market performance. In contrast, the VECM model produced a positive and significant coefficient of 0.169 (p = 0.010), indicating that in the short term, higher real interest rates may attract capital into the stock market as investors seek higher returns. This dynamic reflects a potential short-term portfolio reallocation toward interest-sensitive investments, even though the long-term effects remain contractionary.

The final objective explored the role of exchange rates. The regression analysis showed a positive coefficient of 0.048 (p = 0.188), while the VECM model similarly reported a positive but statistically insignificant coefficient of 0.071 (p = 0.471). These findings indicate that exchange rate fluctuations do not have a significant impact, either in the short or long term, on stock market development in Kenya. Although a depreciating currency may improve export competitiveness and support earnings for certain listed firms, the effect appears too weak or inconsistent to significantly influence the overall performance of the stock market. This suggests that other

structural and financial market factors may have a more dominant role in shaping market dynamics.

5.3 Conclusion

The research findings can guide to draw the conclusions illustrated from the study. Regression results showed a strong, positive, and statistically significant relationship between GDP and stock market development (coefficient = 0.785, p = 0.000). This affirms that economic growth enhances corporate earnings, investor confidence, and ultimately, stock market expansion. VECM results, however, reported an insignificant short-run coefficient (0.047, p = 0.720). This implies that GDP's impact on market development is more structural and long-term rather than immediate. The disconnect in the short term may stem from Kenya's large informal economy, agriculture-dominant GDP, and non-listed state enterprises, which do not directly influence listed company valuations. Hence, GDP growth does not always translate into immediate stock market growth.

The regression model indicated a negative but statistically insignificant effect of inflation on stock market development (coefficient = -0.144, p = 0.205). This suggests that persistent inflation during the period under review may have reduced real investment returns but did not materially affect overall stock market expansion. In contrast, the VECM model showed a positive and statistically significant short-run effect (coefficient = 0.338, p = 0.001), implying that inflation may boost stock prices in the short run due to nominal asset growth or speculative behavior. These findings highlight the dual role of inflation it can erode long-term real value while driving short-term speculative investment during inflationary spikes. Policymakers and investors must distinguish between real vs. nominal growth in asset values under inflationary conditions.

Findings from the regression analysis confirmed a negative and significant long-term effect of interest rates on stock market development (coefficient = -0.259, p = 0.017), supporting conventional macro-financial theory that higher borrowing costs reduce firm profitability and discourage equity investments. However, the VECM results indicated a positive and statistically significant short-run effect (coefficient = 0.169, p = 0.010), suggesting that elevated interest rates may temporarily attract capital into the financial market as investors seek higher yields. This short-term attractiveness of high interest rates may benefit the stock market in the form of capital reallocation from low-yield assets. However, sustained high rates would likely dampen long-term stock market growth. The Central Bank must, therefore, strike a delicate balance in interest rate policy to avoid undermining investor sentiment.

Both the regression model and VECM analysis revealed a positive but statistically insignificant relationship between exchange rates and stock market development (regression coefficient = 0.048, p = 0.188; VECM coefficient = 0.071, p = 0.471). While a weaker Kenyan shilling may support export-oriented listed companies, exchange rate volatility does not significantly influence market-wide development, likely due to limited export exposure among NSE-listed firms and subdued foreign investor activity. The muted effect could also reflect investor caution in volatile currency environments.

The VECM analysis reveals that stock market development in Kenya is subject to both short-term dynamics and long-term equilibrium forces. While the long-term equilibrium is restored when there are deviations, short-term adjustments depend on various factors. Inflation and real interest rates were found to have significant short-term impacts on the stock market, whereas GDP and exchange rates did not exhibit statistically significant short-term effects in the model.

The negative and significant coefficient of the error correction term underscores the presence of a long-term relationship among the variables, confirming that any short-term fluctuations are corrected over time to restore equilibrium. This suggests that while short-term variations in macroeconomic factors can influence the stock market, there is a tendency for the system to revert to its long-run equilibrium state.

5.4 Recommendations

General as well as policy recommendations are suggested in this section to understand the relationship associated with macroeconomic factors and stock market development in Kenya.

5.4.1 General recommendations

A stable and growing GDP has a significant positive effect on stock market development, which can attract both domestic and foreign investments. Initiatives that stimulate economic growth should continue to be prioritized such as; investments in market infrastructure, education, and technology should be made to foster long-term economic growth, which would, in turn, drive stock market expansion. Since GDP did not show a significant short-term effect in the VECM analysis, Kenya's policymakers should consider diversification strategies to drive stock market development beyond reliance on economic growth. improving transparency, and fostering investor confidence can help create a more resilient and dynamic stock market. The study also recommends implementation of robust legal frameworks and regulatory oversight to ensure investors protection and safeguarding of their rights. Financial infrastructure could as well be developed to enhance the efficiency of clearing and settlement systems while expanding access to financial services. Financial literacy could be enhanced by teaching the public on investment and the benefits of participation in the stock markets.

Given the negative impact of interest rates on stock market development, it is essential to maintain a balance between stimulating economic activity and controlling inflation. Monetary policies that keep real interest rates at manageable levels help lower borrowing costs, encourage investment in the stock market, and stimulate economic growth. The positive short-term impact of interest rates suggests that moderate increases could attract investment in the stock market. However, as higher interest rates can discourage borrowing and investment in the long term, monetary authorities should aim to maintain interest rates at levels conducive to both stock market development and overall economic growth. Therefore, a well-developed financial market with different market participants and diverse instruments for investment should be developed so as to absorb interest rates fluctuations. Investors should however, also seeks to maintain a well-diversified portfolio that can effectively manage risk occurring from interest rates environment changes.

Although inflation was not found to be statistically significant in this study, this variable can affect investor confidence. Efforts to stabilize the macroeconomic environment, such as controlling inflation and maintaining a stable exchange rate, can ensure that external factors do not disrupt stock market activities. Given that inflation positively influences stock market development in the short term according to the VECM model analysis, there is an opportunity for investors to capitalize on inflationary periods. However, policymakers should manage inflation carefully to avoid destabilizing the economy in the long run, as excessive inflation can erode investor confidence and market stability. It is therefore recommendable to enhance a mature and efficient stock market that could be in a position to mitigate the inflationary impact by providing viable channels that can hedge against risks associated with inflation.

Possible recommendations on the positive significant relationship between exchange rates and stock market development can be enhanced through diversification of markets on exports reducing an economy's dependence on a strong currency. Policymakers should continually focus on strengthening and developing Kenya's financial markets by improving transparency, increasing investor education, and ensuring proper regulation. A well-functioning stock market can provide businesses with access to capital while also offering investors the opportunity for wealth creation especially in the domestic market so as to entice both local and foreign investment.

To promote stock market development, policymakers should prioritize achieving a stable macroeconomic environment. The significant error correction term highlights the importance of long-term stability, as short-term deviations tend to be corrected enhancing market stability. Market participants also have to enhance due diligence by being updated on global developments and news economically that can impact exchange rates and the overall stock market.

5.4.2 Policy recommendations

Policies to attract and encourage foreign investment in the stock market as well as to bring informal business into the formal market should be implemented to formalize the informal sector. Policy makers and the government should also aim to reduce the bureaucratic hurdles by streamlining the business registration and licensing processes. The government could also improve infrastructure to promote business operations, and lower tax burdens by implementing tax policies and incentives that enhance economic growth and investment in equity markets. To enhance stock market development policy makers should create more items to trade as financial instruments that attract investments such as derivative markets that can manage risks and increase an investor's portfolio.

Inflation and stock market development relationship is dependent on various factors such as level of inflation, its persistence and the general economic condition. Policy makers including the Central Banks should be crucial in managing inflation while enhancing stable economic environments that facilitate growth of stock markets. This is necessary as market participants expectations on future inflation and economic growth affects prices and returns in the stock market. Policies on financial market development such as improving investor protection, enhancing market infrastructure and promoting corporate governance should be enhanced.

Governments and policy makers should work towards creation of stable economic environments which can sustain effective growth and enhance stock market development in times of low inflation. Government policies such as tax incentives that support and enhance stock market development which can impact interest rates, stock market development and prices of stocks.

Policies laid down by market institutions, policy makers or governments should be enhanced to support growth of stock markets, economic development, reduced inflation while maintaining a stable exchange rate. Policy makers should actively observe and monitor the effects brought by market competition and trade balances in the economy's balance of payments. This can enhance a country's trading while maintaining a capital flow that is significant.

5.5 Suggestions for further study

The macroeconomic variables used for this study were Gross Domestic Product, inflation, interest rates and exchange rates. Other macroeconomic variables could be incorporated in further studies so as to have an overall wider scope towards their effects on stock market development.

Market capitalization was used as proxy for stock market development in this study. However, stock market liquidity and volatility, regulation and infrastructure as well as stock

market returns could be used as measurement proxy for stock market development. Other studies could use any of the measures to determine development of the equity market in Kenya.

Research in the future can be carried out under a longer time frame with complete data on the period under study as the study used annual data to ascertain the relationship between the variables. Different data sets could subsequently be incorporated

Further study on macroeconomic factors could be done including other factors such as Foreign Direct Investment (FDI), investor savings and foreign equity. This would better determine their effects in conjunction to macroeconomic factors to stock markets.

5.6 Limitations of the study

The study used market capitalization as proxy for stock market development which might not represent efficiently and truly the total value of stocks listed on the firms in the Nairobi security's exchange.

Stock market development was measured using market capitalization. There are different indicators that can be implemented such as market liquidity, investor participation, trading volume, number of listed companies, corporate governance and regulatory framework.

Data gaps in some variables were encountered in the study. Determining the annual data value of stock market development in 2023 was not feasible due to data lag caused by financial institutions and government agencies to release annual reports.

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APPENDICES

Appendix 1 Secondary Data Collected

year	Period	GDP	INF	RIR	EXCH	SMD
2000	1	1.69	4.13	9.12	74.99	9.28
2000	2	2.15	4.25	8.85	75.95	9.51
2000	3	1.27	4.42	9.42	76.94	9.74
2000	4	2.93	4.58	9.15	76.96	9.97
2001	1	2.45	4.21	8.68	77.45	11.35
2001	2	1.82	4.35	8.41	76.53	11.58
2001	3	1.59	4.50	9.01	81.81	11.81
2001	4	2.15	4.65	8.74	78.69	12.04
2002	1	1.71	4.38	8.23	78.71	13.65
2002	2	1.27	4.52	7.96	77.79	14.11
2002	3	1.45	4.68	8.53	76.87	14.35
2002	4	1.69	4.83	8.26	80.05	14.89
2003	1	-0.50	4.55	10.89	72.39	16.07
2003	2	0.4	4.71	8.62	73.47	16.31
2003	3	6.5	4.87	9.84	74.55	16.55
2003	4	5.2	5.03	9.36	75.63	16.79
2004	1	6.9	5.1	5.23	81.13	17.5
2004	2	5.1	5.27	5.01	80.21	17.8
2004	3	3.2	5.44	5.17	79.29	18.1
2004	4	5.3	5.61	4.88	78.37	18.4
2005	1	2	5.78	7.19	77.45	22.4
2005	2	7.3	5.95	7.47	76.53	22.7
2005	3	8.4	6.12	8	77.61	23
2005	4	5.9	6.29	7.75	75.69	23.3
2006	1	6	6.46	-8.08	71.68	35.5
2006	2	6.2	6.63	-8.25	72.41	30.5
2006	3	8.2	6.8	-7.14	70.31	34.17
2006	4	4.9	6.97	-8.01	73.91	34.73
2007	1	7.1	7.41	5.15	66.79	25.6
2007	2	8.3	7.13	4.83	67.32	25.9
2007	3	6.3	6.9	4.57	67.88	26.4
2007	4	6.4	7.65	4.29	68.29	26.6
2008	1	1.1	8.1	0.51	69.5	17.18
2008	2	2.2	7.8	0.33	70.1	17.72

2008	3	2.6	7.5	0.15	71.3	18.35
2008	4	0.2	7.2	-0.03	72.5	18.65
2009	1	6.2	10.3	-9.71	73.1	10.2
2009	2	1.9	9.4	-10	74.5	10.43
2009	3	1.9	8.7	-10.29	75.8	10.66
2009	4	1.2	8.1	-10.58	77.2	10.89
2010	1	6.6	6.8	12.03	78.4	15.11
2010	2	7.6	6.5	12.32	80.1	15.35
2010	3	7.9	6.3	12.61	81.9	15.59
2010	4	11.6	6.1	11.94	83.7	15.83
2011	1	7.6	5.6	4.93	85.5	18.7
2011	2	6.7	5.4	4.63	87.3	19
2011	3	5.8	5.2	4.03	89.1	19.3
2011	4	4.4	5.1	4.33	90.9	19.6
2012	1	4.2	6.5	8.59	83.15	20.1
2012	2	4.3	6.3	8.87	83.63	21.4
2012	3	5	6.2	9.71	84.12	21.8
2012	4	4.7	6.1	9.43	84.61	22.11
2013	1	6.1	7.5	9.15	85.25	20.1
2013	2	7.5	7.3	10.29	85.83	20.4
2013	3	6.4	7.2	8.47	86.42	20.9
2013	4	3.5	7.1	9.29	87.01	21.2
2014	1	5.2	6.8	8.71	87.3	17.9
2014	2	6	6.6	9.15	89.1	18.3
2014	3	4.6	6.5	7.03	90.9	18.6
2014	4	5.6	6.4	7.91	92.7	19.1
2015	1	5.7	6.3	6.42	102.15	21.3
2015	2	5.6	6.2	6.11	102.37	21.6
2015	3	6.1	6.1	6.18	103.05	21.9
2015	4	5.5	6	6.49	103.15	22.2
2016	1	3.8	6.3	10.23	101.83	22.4
2016	2	3.8	6.11	10.01	102.67	22.7
2016	3	4.4	5.4	9.83	102.95	23
2016	4	4.8	5.24	9.58	103	23.3
2017	1	5.4	4.69	6.13	101.17	23.5
2017	2	3.3	8.01	5.07	102.33	23.8
2017	3	3.2	6.3	5.74	103.5	24.1
2017	4	3.5	6.58	6.01	104.83	24.4
2018	1	5.2	6.88	8.29	100.88	24.6
2018	2	6.1	5.72	7.15	101.58	24.9
2018	3	5.3	9.38	8.69	102.54	25.2
2018	4	6	14.02	9.88	102.54	25.5
2019	1	4.8	3.96	6.69	103.45	23.55

2019	2	6	9.23	5.48	104.15	24.35
2019	3	5	14.45	5.74	105.39	24.15
2019	4	4.6	10.31	6.23	106.41	24.35
2020	1	4.6	11.62	6.35	106.45	19.5
2020	2	-4.1	9.82	6.63	107.29	20.16
2020	3	-3.6	1.96	6.91	108.15	20.22
2020	4	2	5.74	7.19	109.51	21.5
2021	1	2.4	6.72	7.27	110.21	20.35
2021	2	10.3	11.36	7.11	111.39	20.41
2021	3	9.4	8.86	8.03	114.75	21.55
2021	4	8.6	7.66	7.39	116.05	21.69
2022	1	5.9	9.98	6.69	117.51	21.6
2022	2	4.9	5.74	5.48	118.39	14.2
2022	3	4.6	6.72	5.6	119.95	14.72
2022	4	4.1	11.36	6.23	121.25	14.18
2023	1	5.5	8.86	6.31	121.59	14.2
2023	2	5.6	1.55	6.57	122.47	14.55
2023	3	6	28.81	6.07	123.85	14.9
2023	4	5.1	45.98	7.25	124.15	14.9