

**EFFECT OF INFLATION RATE ON STOCK MARKET VOLATILITY IN FRONTIER
CAPITAL MARKETS: A CASE FOR KENYA NAIROBI SECURITIES EXCHANGE**

BY

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DECLARATION

The project is my original work and has not been submitted in any other university or institution for examination or award.



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The research project has been submitted for examination with my approval as the university supervisor.



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Date

DEDICATION

The dedication of this project goes to my supportive and loving parents who have extended unconditional support to me both financially and emotionally while undertaking this master's program. Their support has been helpful in pursuing this program.

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ABSTRACT

Policymakers and investors have been closely monitoring the volatility of stock prices in the capital market, which has significant policy and practice implications to portfolio risk management, pricing of derivative securities and for portfolio diversification. A stable stock market is an ingredient to the financial sector stability of any economy. However, investors lose confidence in a highly volatile stock market because of the uncertainties that comes with it which erodes investor confidence negatively affecting its performance. At NSE, volatility of stock prices is a common phenomenon that instills fears to investors as certain drop in share prices may result to massive losses to investors. The volatility of stock prices makes it hard for investors to make concrete investment decisions on whether to invest in a particular firm or certain products and services. The purpose of the study aims at determining how inflation rate impacts stock market volatility with focus to NSE. The general objective is supplemented by specific objectives that included determining the level of stock market volatility at NSE, determining of inflation effects rate on stock market volatility at NSE and to draw policy recommendations from the study findings. The theories that guided the study include Fisher hypothesis, proxy hypothesis and inflation illusion hypothesis. Time series data covering the period 1990 to 2020 would be utilized and would be sourced from, WDI, Nairobi Securities (NSE) reports and Central Bank of Kenya (CBK). Eviews Software was utilized in analyzing the secondary data collected. The analysis of data entailed inferential and descriptive statistics. The Skewness and Kurtosis, maximum and minimum as well as means and deviations from the means formed the descriptive results. Inferential statistics entailed time series models to determine inflation rates effects on the volatility of stock market at NSE. The research conducted pre and post estimation tests that included stationarity test, heteroscedasticity tests, serial correlation and normality tests. The study concluded that throughout the period under review, there were variations in the stock market volatility. Furthermore, the correlation between stock price volatility and inflation rate was positive, moderately strong and statistically significant. Finally, the correlation between stock price volatility and inflation rate was moderately strong and statistically significant. A recommendation was made to the government via the monetary policy committee of the central bank ought to revise its interest rates less frequently and that the changes in the interest rates should be minimal. This would be significant in stabilizing inflation rates. In addition, the government ought to come up with policies including introduction of subsidies that would tame the rising prices of some products and hence tame the rates of inflation, which would subsequently stabilize the stock market.

CHAPTER ONE: INTRODUCTION

1.1 Background

Stock markets globally entail markets where securities are traded. It serves as a secondary market where stock investors trade their stocks in order to mitigate the risks on the investments while at the same time keeping system liquidity. It also serves as a market where municipalities, governments, corporations and other incorporated bodies can raise capital (Popescu, 2020). Some of the largest global securities markets include Tokyo Stock Exchange, Shanghai Stock Exchange London Stock Exchange and New York Stock Exchange among others. However, stock markets in sub-Saharan Africa including countries like Kenya, South Africa, Zimbabwe, Nigeria and Ghana have low capitalized stock markets (Baklaci et al., 2020).

Stock volatility can be occasioned by varied economic, industry, political or social factors including changes in the trends of inflation, sector and industry factors, exchange rates, interest rates, oil prices, money supply among others (Aziz et al., 2020). Volatility is defined as the randomness or changeability of prices of assets. A change in the volatility of the prices of shares may be caused by changes in the volatility of future discount rates or cash flows. Volatility of stock markets entails the measure of the changes of the overall value of a particular stock market (Othman et al., 2020). The unexpected rise or fall in the stock market prices leads to uncertainties in the investor returns on their investments in stocks. Thus, investors are always keen on trend direction of the values of stock market (Bloom, 2014).

Inflation entails general rise in the prices of commodities and services because of currency devaluation. High inflation rates occurs when unexpected prices of commodities occur. Inflation reduces the purchasing power but maybe a good thing to entrepreneurs. If inflation occurs and incomes remain unchanged, the purchasing power of everyone is effectively reduced leading to slow or stagnant economy. Inflation may also entail how much the dollar is worth at a given moment with regards to purchasing (Girdzijauskas et al., 2022). Kaplan & Schulhofer-Wohl (2017) points out that inflation expressed as a percentage entails a quantitative measure indicating the average rate of change of the prices of selected basket of services and goods over a period of time. It can be used as an indication of the devaluation of the country's local currency. Higher inflations may be occasioned by factors such as the periods of threat of war, oil shocks, financial crises among others.

Inflation and gross national product are some of the causes of the volatility in the market of stocks. High inflation also causes uncertainty, which may ultimately lead to a slowdown in the economic activities of a particular economy. Inflation is categorized as expected inflation and unexpected inflation. The returns on stock is largely affected by the unexpected inflation as opposed to the expected inflation. When inflation rises, the nominal stock returns as well as the nominal dividend payments should also rise implying that nominal stock returns and inflation move in similar direction. It is however, imperative to note that there has not been consensus in the academic literature on how inflation affects stock market (Sathyanarayana & Gargesa, 2018).

In the US, COVID-19 pandemic outbreak resulted to unprecedented social, economic disturbance and considerable rise in unemployment with the resultant increase in the inflation and interest rates to 9.1% in June 2022. As a result, the investors in the stock markets began to sell stocks as they anticipated economic slowdown and unprecedented increase in the price of commodities and services. Thus, based on these evidences, inflation have negative correlation with stock market prices (Chiang & Chen, 2023).

Sreenu and Naik (2020) indicated the existence of a long-term correlation between inflation and market returns in India, but not a short-term one. Additionally, a strong short- and long-term correlation between the values of Indian stocks and the overall increase in the cost of goods and prices was demonstrated by the monthly periodicity of inflation. The conclusion of Sreenu and Naik (2020) was that in India, inflation rate negatively correlates with stock market prices.

In Indonesia, a study by Sia et al. (2023) pointed out short-run and long run impacts of inflation on the price of stocks and a detrimental effect of both negative and positive changes on the prices of stocks. As per the results, it is the expectation that the stock prices would behave independent of the rates of inflation. However, inflation impacts on stock prices depends on the capability of the investor in hedging as well as the inherent monetary policies inherent within an economy. Spiraling inflation rates is linked to smaller equity markets and less liquid.

In Nigeria, a research by Okechukwu et al. (2019) pointed out that the returns on the market for stocks and interest rates negatively correlate whereas exchange rates and the rates of inflation had positive significant correlation with the stock market prices. Thus, this provides the evidence of the persistent high volatility on returns in Nigerian Stock Market. These results formed a contrast of the findings by Tarza Sokpo et al. (2017) who found that CPI inflation insignificantly determine the volatility of market stock returns in Nigeria.

In Egypt, a research study by Eldomiaty et al. (2020), there was evidence of the presence of a negative nexus existing between rates of interest and the stock returns. Changing inflation rates granger causes a significant negative fluctuation in stock market returns. A study by Sathyanarayana and Gargesa (2018) further confirms these findings as it indicates that high inflation affects the economy because of the uncertainties it creates as well as stock market volatility that is high. As compared to the expected inflation, the unexpected inflation poses a threat to the volatility in the market for stocks.

In Uganda, Hussein (2017) made the demonstration that equity stocks can act as a cushion in the face of inflation. In cases when investors are expecting a rise in the rates of inflation, they are likely to exchange their financial assets with real assets. Thus, the prices of stocks tend to react to the prevailing information on the economic variables including inflation. It is therefore evident from the demonstration that inflation rates and equity stocks negatively relate considering the Uganda Securities Exchange.

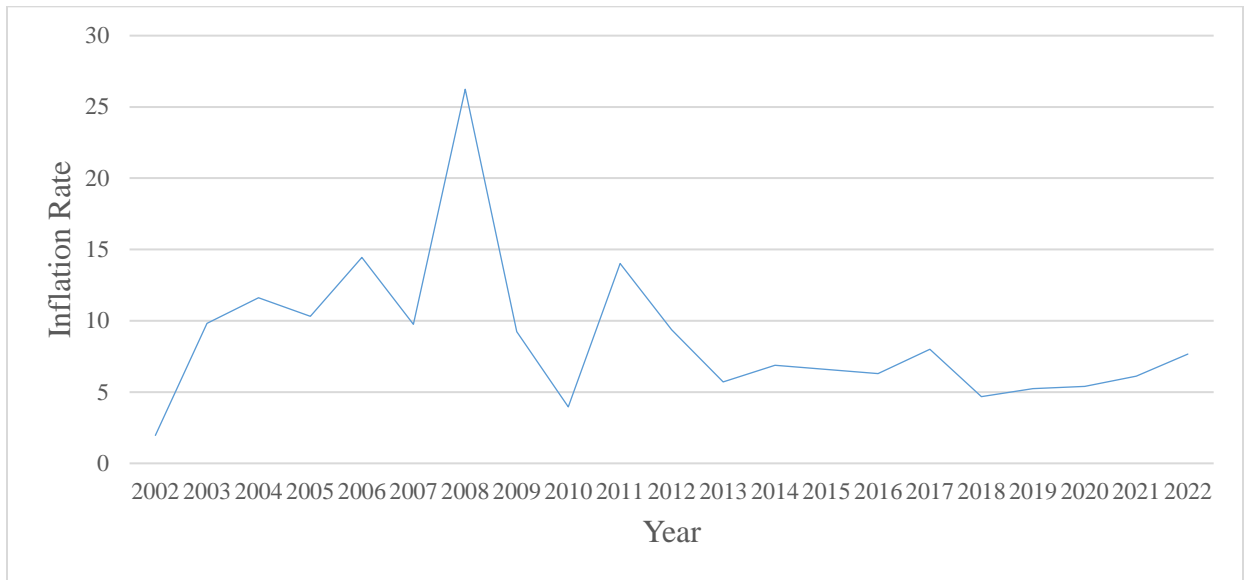
In Kenya, Otieno et al. (2019) in their study indicated that comparing stock market returns, year-on-year inflation rate and month-on-month inflation rate demonstrated non-integer orders of

integration. Further, cointegrating findings had non-integer orders of integration and hence the prolonged variance from the long-run relationship which contrasts conventional cointegration framework assumption.

1.1.1 Inflation Rate

Inflation entails the quantitative measure that is used to indicate that rate at which the prices of a basket of commodities and services increase over time. Inflation is usually expressed in percentage and as well can be used to explain the level of devaluation of a currency of a particular economy (Kaplan & Schulhofer-Wohl, 2017). Unprecedented inflations happen in volatile socioeconomic and political environments featured by global financial distress, conflict, oil shocks, political disturbance and health pandemic threats. High inflation rates occurs when unexpected prices of commodities occur. Inflation reduces the purchasing power but maybe a good thing to entrepreneurs. If inflation occurs and incomes remain unchanged, the purchasing power of everyone is effectively reduced leading to slow or stagnant economy. Inflation may also entail how much the dollar is worth at a given moment with regards to purchasing (Girdzijauskas et al., 2022). The price stability of commodities and prices in any economy is reflected in the rates of inflation. Inflation is both beneficial and detrimental. It can be beneficial as it stimulates the growth of jobs. However, through inflation, company profits are cut, affecting their performance and by extension their ability to recruit more staff. Furthermore, a rise in inflation diminish consumers' purchasing power which then affects the entire economy (Sia et al., 2023). One way to conceptualize inflation would be as a rise in the quantity of money that drives up prices. For consumers, low inflation is better purchasing price on goods and services remains lower and wont at much into their income. A high inflation introduces uncertainty and erodes the purchasing power of currency. Inflation can be classified into five categories namely, deflation, stagflation, hyperinflation, galloping inflation and creeping inflation. Uncontrolled inflation result to decline in real wages, hinder investments and lower saving power in the economy (Sathyanarayana & Gargesa, 2018). Figure 1.1 outlines the trend of inflation in Kenya between 2002 and 2022.

Figure 1.1: The Trend of inflation in Kenya



From the trend curve presented, it can be noted that there has been a variation of inflation in Kenya between the years 2002 and 2022. Between 2002 and 2007, Kenya witnessed a relative increase in the rates of inflation measured using consumer price index. In addition, between 2007 and 2008, there was a spike in the country's inflations, which was notably linked to the post-election violence of the time. However, between 2008 and 2010, there was a significant decline in the inflation rates in Kenya. This can be attributed to the relative calm in the country following the handshake between the leading political leaders. Kenya further witnessed an increase in the rate of inflation between 2010 and 2011 and a decline between 2011 and 2013 after which, it saw a relative stability between 2013 and 2022.

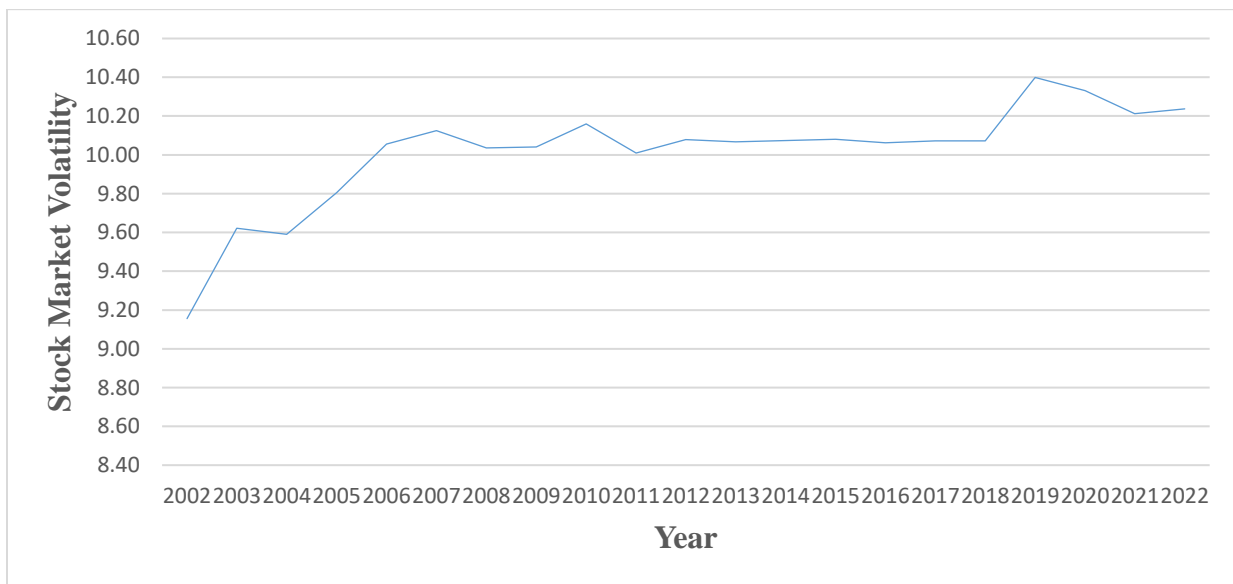
1.1.2 Stock Market Volatility

Stock markets globally entail the markets where securities are exchanged. Stock markets serve as an auxiliary market where investors trade securities in order to reduce risks on investments and maintaining liquidity in the system. It also serves as a market where municipalities, governments, corporations and other incorporated bodies can raise capital (Popescu, 2020). Stock volatility can be as a consequence of a number of factors comprising changes in the trends of inflation, sector and industry factors, exchange rates, interest rates, oil prices, money supply among others (Aziz et al., 2020). Volatility of stock market returns entails the measure of the fluctuation of the overall value of a particular stock market (Othman et al., 2020). The unexpected rise or fall in the stock market prices leads to uncertainties in the investor returns on their investments in stocks. Thus, investors are always keen on the direction of the trends of the stock market values (Bloom, 2014).

Investors believe that the fluctuation of stock prices is largely influenced by various macroeconomic activities. In gauging the state of stock market in terms of investor returns, investors may employ the macroeconomic indicators as a forecasting standard.

The performance of macroeconomic factors acts as a yardstick for investors in security market and how the performance and behaviour of these macroeconomic parameters would likely affect stock market returns. Fluctuation of stock prices affect investor returns thus affecting the entire economy right from the investors and the financial managers. Hence, because of unstable microeconomic environment, the emerging markets are highly volatile (Okechukwu et al., 2019). Figure 1.2 presents the trend of stock market volatility at the NSE.

Figure 1.2: Trend of Stock Market Volatility at the NSE



The results outlined in Table 1.2, the stock market volatility measured by market capitalization varied during the period under review. Between 2002 and 2003, there was an improvement in the market capitalization among the companies listed at NSE. However, between 2003 and 2004, the market capitalization of the companies under review remained unchanged and further saw an improvement between 2004 and 2010. Between 2012 and 2018, the market capitalization of the companies listed at NSE remained largely constant. However, it improved between 2019 and 2020 and saw a slight decline between 2020 and 2022. Generally, over the period of study, the listed companies saw an improvement the market capitalization implying that the value of the stocks for the companies saw an improvement during the period under study.

1.2 Statement of the Problem

Stock market volatility is witnessed globally. The volatility of stock markets has been attributed to macro-economic including inflation and GNP. Investors believe that fluctuation of stock prices is largely influenced by the various macroeconomic activities. The volatility in the stock market

affects the entire economy right from the investors and the financial managers. Hence, because of unstable microeconomic environment, the emerging markets are highly volatile (Okechukwu et al., 2019).

Policymakers and investors have been closely monitoring the volatility of stock prices in the capital market, which has significant policy and practice implications to portfolio risk management, pricing of derivative securities and for portfolio diversification. A stable stock market is an ingredient to the financial sector stability of any economy. However, investors lose confidence in a highly volatile stock market because of the uncertainties that comes with it which erodes investor confidence negatively affecting its performance (Kisoso, 2019).

At NSE, volatility of stock prices is a common phenomenon that instills fears to investors as certain drop in share prices may result to massive losses to investors (Muigai & Cherono, 2019). The volatility of stock prices makes it hard for investors to make concrete investment decisions on whether to invest in a particular firm or certain products and services. The downward translations of prices of stocks for various firms during trading at the securities exchange reduces the monetary value of the investors capital who have invested in them.

The stock market volatility is affected by numerous factors some which are global factors like the 2008 financial depression (IMF, 2009), the Covid-19 pandemic (Basuony et al., 2022; Khatatbeh et al., 2020) and oil prices (Khan et al., 2021) while others are localised factors like individual economic growth of a country (Chikwira & Mohammed, 2023), exchange rate (Lakshmanasamy, 2021), interest rate (Hajilee & Nasser, 2017) and geopolitical disruptions like the Russia and Ukraine war (Kumari et al., 2023). Thus, stock market volatility is an economic phenomenon that need to be more researched on focusing on macro-economic factors, geopolitical factors and firm specific factors. This is the conceptual gap which this study aspires to address by studying the nexus between inflation rate and Kenyan volatility of stock market, and what other macroeconomic, political and industry factors effect stock market performance.

Inflation has shown to have contradictory effect on stock return, with other showing positive relationship (Tripathi, & Kumar, 2014). However, other scholars indicate negative relationship (Raghutla et al., 2020; Shahabinezhad et al., 2022) while Sreenu (2023) in India indicated that in the short run, inflation insignificantly affects stock returns. Some studies however, shows that inflations significantly affect stock market volatility. According to the scholars, unprecedented inflation creates economic uncertainties and market for stock resulting to fluctuation in stock market prices. Other studies have indicated that expected inflation levels is not risky to stock market but unexpected inflations pose significant threat to level of returns from the stock market. The nominal stock market returns acts as a cushion against inflation as rising inflation rates results in increased expected nominal payments (Sathyanarayana & Gargesa, 2018).

Despite numerous studies having been done in this field, the findings of these studies are contradicting. Studies by Sathyanarayana and Gargesa (2018) indicated that the unexpected inflation has a significant negative effect on the returns in capital market as opposed to the expected inflation. Sreenu and Naik (2020) also showed existence of a long-term correlation between

inflation and stock market volatility in India, but not a short-term correlation. Consequently, inflation had a detrimental impact on Indian stock market results. Sia et al. (2023) observed that the price of stocks is asymmetrically affected by inflation both in the short and long terms, and that both positive and negative changes in inflation are detrimental to stock prices. The findings point out that, prices of stocks would behave differently depending on the periods of inflation, state of the economy, industry factors and political factors. Positive correlation between inflation and stock market returns were pointed out by Okechukwu et al. (2019) while Tarza Sokpo et al. (2017) found that CPI inflation insignificantly determine the volatility of market stock returns in Nigeria. It is evident from these studies that there is no consensus on the findings; the study seeks to determine how inflation rates affect stock market volatility by narrowing to stock market in Kenya.

1.3 Research Objectives

- i. To determine the level of stock market volatility at the NSE.
- ii. To determine the correlation (positive/negative) between inflation rate and volatility of stock prices at the NSE.
- iii. To determine the degree of correlation (high, low, medium) between inflation rate and stock market volatility at the NSE.

1.4 Research Questions

- i. What is the level of volatility of stock market at the NSE?
- iv. What is the correlation (positive/negative) between inflation rate and volatility of stock prices at the NSE?
- v. What are the degree of correlation (high, low, medium) between inflation rate and stock market volatility at the NSE?

1.5 Significance of the Study

The research is significant to practice, policy and research. Inflation rate significantly impacts the productivity of any economy and hence her economic development. The performance of stock markets especially NSE largely depends on the performance of the companies listed in the stock market. Thus, the research findings may inform the stock market participants on the correlation between inflation rates and stock volatility. The study findings would also improve the investors' understanding and evaluation of the relevant stock prices movements to the systematic influences of macroeconomic parameters such as inflation rate. The derived information about the link between the macroeconomics parameters and stock market performances may enable investors to make optimal and prudent investment decisions regarding the global business securities.

The findings further are crucial to the policy makers, especially the capital market authorities, government and monetary policy committee. To the government, the study would inform it on the kind of policies that may affect the pricing of the consumable goods and services. To the monetary policy committee, the study would inform of the policies, especially to do with the interest rates control because the kind of in place largely determines the rate of inflation.

The study would further be significant to the scholars would be furthering studies in the field of study in the future. It is evident that past studies conducted in various countries indicate conflicting results and hence the study results at hand are of great importance in an attempt to come to a common ground regarding the nexus between inflation and volatility of stock market.

1.6 Organization of the study

The remaining part of this study are arranged as follows: theoretical anchorage, literature review and overview of literature are presented in chapter two. Chapter three presents the empirical and theoretical models, definition of variables and measurement, data collection and sources, and ends with diagnostic and model assumption tests. Chapter four covered data analysis while interpreting and discussing study outcomes. Chapter five presented the study summary and key findings, outline study conclusions and recommend practical and policy implications.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The theoretical and empirical literature pertaining the correlation between inflation rate and stock market volatility are interrogated in this chapter. Chapter closes by doing an overview of empirical studies and gaps.

2.2 Theoretical Literature

The theories that guided this research comprise the fisher hypothesis, proxy hypothesis and inflation illusion hypothesis.

2.2.1 Proxy Hypothesis

Fama (1981) established the Proxy Hypothesis to illustrate how stock market prices and inflation are related. The idea demonstrated that the negative association between inflation and stock market prices was influenced by the indirect correlation between economic activity, inflation, and stock market prices. The theory further postulate that inflation has an indirect effect on stock prices because as it increases, it negatively affects the expected future profits and finally fall in returns from stocks. As to Pramod Kumar et al. (2012), the Proxy effect suggests that the negative correlation between inflation and stock return serves as a proxy for the positive association between real variables, which the theory argues are more fundamental drivers of equity prices and stock returns.

The theory further pointed out that the real activities including average real return on output and capital and capital expenditure, which reflects the size of capital investments with projected return in excess of capital costs that positively relates to the stock returns (Balduzzi, 1995). Furthermore, the hypothesis notes of the existence of a strong anomalous association between stock market returns and inflation to project real economic activities in the future (Cochran and DeFina, 1993), that are in line with the view of rational expectations where, for securities and goods' markets set stock market prices as guided by relevant future forecasts of macroeconomic variables.

This theory is relevant in explaining stock volatility because based the theory, the inflation and returns on stock relationship is not real and that it is the relationship between returns on stock and other variables that matter. However, inflation indirectly affects stock returns through other variables such as exchange rates among others. This explains why the theory is significant in explaining stock market volatility.

2.2.2 Inflation Illusion Hypothesis

Modigliani and Cohn (1979) postulated the theory and states existence of negative correlation between inflation and stock market returns is because of inflation Illusion. The theory points out that the negative nexus existing between inflation and stock returns is attributable to illusion, which has led the irrational investors by employing nominal interest rates to discount real cash flows. The theory further points out that the failure of investors to comprehend the inflationary effects on growth rates of nominal dividend makes them to consider the historical data on the rates of growth

including in the periods of changing inflation (Muriuki, 2014). According to the theory, because of money illusion, two errors are committed by investors in valuing equities. Investors lose out on the capital gains that corporations with fixed dollar obligations make on their shareholders when inflation occurs. According to Konchitchki (2011), they do not alter the nominal growth rate of dividends since they utilize the nominal rate to deduct actual cash flows.

This theory is useful in this study interrogates the genesis of stock market volatilities as a result of the inflationary illusion by the investors which results in them making errors in their decisions. The investor decisions on whether to make more investments, sell their stocks or retain them on the basis of inflationary illusion is a significant determinant of the volatility in the stock market.

2.2.3 The Fisher Hypothesis

The Fisher hypothesis is an economic theory that was postulated by Fisher (1930). It hypothesized that stock returns and inflation depict a positive correlation essentially in the wake of increasing inflation, assets ought to maintain their values. Thus, it is hypothesized that the returns on nominal assets ought to move in similar direction as the expected inflation such that the real returns on stock should not be determined by the changes in inflation directly but by other real factors. This therefore implies that stock market returns has a positive correlation with inflation. However, if this condition fails to hold, then the stock markets investors would be at risk to the rising rates of inflation. Thus, holding other factors constant, a rise inflation would result in an equivalent rise in returns on stocks in a market that is efficient where stock prices reflected the current and the expected rate of inflation.

The theory is significant because it provides an explanation that prices of stock have a positive association with inflation with expectation that as inflation increases the nominal value of the stock should remain the same, otherwise the investors would be vulnerable to inflation. Thus, the theory is thus fundamental in understanding the variability in the stock market prices across the stock markets globally.

2.3 Empirical Literature Review

The empirical works on how inflation rate affects stock market volatility have not been conclusive and have presented mixed results. In a study, Gibet, Benard (2016) used ARDL model for sectors with stationary variables, Johansen Cointegration Test for sectors with non-stationary variables were and finally ECM was used after confirmation of cointegration and concluded that inflation affects the entire stock market positively both in the short run and long run. The long run ARDL findings from a study by Babu (2017) however showed that inflation effect on the stock market returns is positive but statistically insignificant. According to the ARDL short term results, inflation positively and significantly correlates stock market performance. Gargesa and Sathyanarayana (2018), however, noted that inflation negatively correlates with stock market returns in Canada, Austria, Belgium, India, Chile, France and China.

In research on the volatility of the stock returns and inflation in the market economies emerging, Dridi and Bouhrara (2023) adopted causal inference methods. The findings demonstrated that

flexible inflation targeting is effective in containing volatility of stock returns. The risk premiums compensating inflation uncertainty thus lowering the volatility of stock prices is shaped by inflation rate targeting. Looking at the US aggregate and sectoral markets, Chiang and Chen (2023) did a study on inflation risk and stock returns employing traditional CAPM model. The findings of this particular investigation indicated that inflation risk negatively affect the returns on stock market in US sectoral and aggregate markets.

Abdalla (2012) employed the GARCH approach, which asymmetrically modelled both symmetric models, researching on the correlation between inflation and volatility of stock market returns in the Saudi Stock Market. The results demonstrated that inflation effect on monthly stock market returns was negligible. Utilizing ECM, ARDL, GARCH, and the related, Sreenu (2023) undercook a study on exchange rate volatility and inflation on the dynamics of stock market returns in India. The findings indicated that the macroeconomic variables controlling the Indian investment cycle movement entail the exchange rates and inflation. The study finds a strong long-term positive correlation between stock market returns, inflation, and exchange rates. However, gains in the stock market were negatively impacted by inflation and currency rates in the short run.

Research undertaken by Eldomiaty et al. (2020) on the reason behind the persistence of the associations among interest rates, inflation, and stock returns employing stock duration model. The panel Johansen cointegration analysis findings postulate of the existence of cointegration between the variation in stock prices in lieu of real interest rates, variability in stock prices is due to inflation rates and stock prices. Results further indicated that the prices of stock and inflation relates negatively. In Thailand however, Limpanithiwat and Rungsombudpornkul (2010) studying the nexus between stock prices and inflation indicated that stock price variation is irrelevant to inflation. The vector autoregression (VAR) statistic method was applied in the study.

A GARCH approach was adopted by Wallin (2020) to examine if macroeconomic elements affect volatility of stocks in the Swedish capital market. The investigation results recorded that prices of international financial market, exchange rate and prices of oil significantly affected prices of stocks. However, money supply, inflation or interest rate did not record any significant effects. In Sri Lanka however, after estimating Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) and VECM models, Fernando (2017) recorded a long run significant negative correlation among exchange rate, Treasury Bill Rate and stock price returns. Inflation rate indicated a positive significant long run correlation with stock returns.

In a study on inflation and interactions of prices of stock in South Africa, Khumalo (2013) did VAR analysis. The causality findings argued the stock prices in South Africa and inflation rates are negatively and significantly related concluding a unidirectional causation from inflation to stock prices. Employing monthly time series data, Aliyu (2012) adopted GARCH model in assessing the association between stock market returns and volatility and inflation in Nigeria and Ghana. The results concur and indicate that the volatility of stock returns and inflation rate in the two countries were significantly related. Thus, the steps undertaken by the countries under review

would significantly boost investor confidence, improve stock market returns and reduce volatility in stock market.

In Philippines, a study by Sucuahi et al. (2016) among diversified companies focusing on how inflation affect the growth of stock price by employing a descriptive correlation design. From the outcomes, the impact of inflation on the diversified companies under review on the growth of stock price, however positive cannot be considered as significant. The findings contrast the findings of Hoong et al. (2023) on stock returns and inflation who indicated that there are low returns on stock when the rates of inflation are high. Thus, investors are not favored by the high rates of inflation even though it may come with increased marginal wealth.

In Uganda, a study was conducted by Hussein (2017) on how inflation affect stock market returns in Uganda stock market. The outcomes pointed out a significantly negative association between returns of stock market and inflation at USE. Thus, the return on USE is negatively and directly influenced by the rates of inflation. These findings are in tandem with those of Jepkemei (2012) study who showed that inflation rate negatively impacts the liquidity of the Nairobi Securities Exchange.

In Nigeria, an investigation by Tarza Sokpo et al. (2017) on volatility of stock market returns and inflation in the Nigerian stock exchange between 1995Q1-2016Q4 used an E-GARCH model. The results pointed out that inflation measured using CPI did not significantly affect the volatility of stock returns in Nigeria. These results contrast the findings of Amata et al. (2016) studying interest rate and inflation and their effect on volatility of stock market in Kenya and indicated a significant positive relationship in the long run between stock market volatility and inflation.

2.4 Overview of Reviewed Literature

As per the above reviewed studies, an evidence exists that the findings regarding the inflation rate impacts on the volatility of stock have not been consistent. Some of the empirical works including those by Gibet, Benard (2016), Babu (2017), Fernando (2017), Sucuahi et al. (2016) and Amata et al. (2016) indicated that inflation positively affects stock market volatility in the different countries. Other scholars including Sathyanarayana and Gargesa (2018), Chiang and Chen (2023), Sreenu (2023), Eldomiaty et al. (2020), Khumalo (2013), Hussein (2017) and Jepkemei (2012) postulated that inflation negatively affects stock market volatility. There are other scholars who found that stock market volatility and inflation in the different countries; Abdalla (2012), Limpanithiwat and Rungsombudpornkul (2010), Wallin (2020) and Tarza Sokpo et al. (2017) do not significantly relate. This is a clear indication that there has never been consensus on inflation effects on the volatility of stock. The proposed study seeks to further studies in the field of study with a focus on Nairobi Securities Exchange. Furthermore, stock market volatility is an economic phenomenon that need to be more researched on focusing on macro-economic factors, geopolitical factors and firm specific factors. This is the conceptual gap which this study aspires to address by studying the nexus between inflation rate and Kenyan stock market volatility, and what other macroeconomic, political and industry factors effect stock market performance

CHAPTER THREE: METHODOLOGY

3.1 Introduction

Theoretical model and empirical model of the study are presented in this section. The chapter also contains the model assumption tests, data analytics and operationalization of variables, data sources.

3.2 Theoretical Framework

The suggested study's theoretical framework was based on the Inflation Illusion Hypothesis (1979) by Modigliani and Cohn and the Proxy Hypothesis (1981) by Fama. There is a negative link between inflation and stock market performance, according to the Inflation Illusion Hypothesis. Equation 3.1 presents this connection.

$$r_t = \beta_0 + \beta_1 \pi_t + e \dots \dots \dots 3.1$$

Where r_t represents stock returns at time t, π_t is level of inflation at time t, β_0 is constant representing other factors that affect stock returns. Similarly, the Proxy Hypothesis developed by Fama (1981) explain the nexus that exist between stock market prices, inflation, and economic activity. This can also be illustrated using equation 3.2

$$r_t = \beta_0 + \beta_1 \pi_t + \beta_2 EA_t + e \dots \dots \dots 3.2$$

Where r_t is stock market price at time t, π_t is level of inflation at period t, EA_t is economic activity at time t, β_0 is constant representing other factors that affect stock returns/ stock market price. Based on equation 3.1 ad equation 3.1. inflation is directly related to stock returns. However, stock returns are affected by other macroeconomic and firm factors. These factors were included in the development of the analytical model as shown in equation 3.3.

3.3 Empirical model

The equation 3.1 and equation 3.2 was modified by adding the other factors that affect stock prices to come up with the empirical model. The factors are derived from the empirical literature review. Some of the other factors that affect include exchange rate (Fernando, 2017; Kwon and Shin, 1999; Khan & Billah, 2023; Sreenu, 2023; Wallin, 2020), interest rate (Eldomiaty et al., 2020; Kwon and Shin, 1999; Wallin, 2020), oil prices (Li et al., 2022; Wallin, 2020), money supply (Fernando, 2017; Khan et al., 2023; Kwon & Shin, 1999; Vychytilová et al., 2019; Wallin, 2020), Treasury bill Rate (Fernando, 2017), economic growth (Kwon and Shin, 1999); Li et al., 2022, Vychytilová et al., 2019); government debt and balance of payments (Kwon & Shin 1999; commodity prices (Li et al., 2022) and market capitalization (Khan & Billah, 2023). The study empirical model of this study integrated inflation, exchange rate and economic growth to ascertain which factors are significant predictors of stock price volatility, the nature and strength of correlation. Thus, the empirical model of the study was;

$$\sigma_t = \beta_0 + \beta_1 \pi_t + \beta_{i-j} \sum_j^i X_{i-j} + e \dots \dots \dots 3.3$$

where σ_t is stock price volatility at time t , π_t is level of inflation at time t , X_{i-j} are other factors that affect price stock volatility and include and comprise interest rate, exchange rate and economic growth.

3.4 Description and Measurement of Variable

The dependent variable was the volatility of stock returns in Kenyan stock market. To measure volatility of stock prices, GARCH model was used. The most widely used tools for analyzing the dynamics of volatility in financial time series are the GARCH and ARCH models. A present conditional variance in the GARCH model is contingent upon the lags of its prior variance. However, one drawback is that it requires symmetric volatility responses to market shocks that cause both positive and negative volatility (Bollerslev et al., 1994).

$$\sigma_t^2 = w + \alpha_1 \varepsilon_{t-1}^2 + \beta_2 \sigma_{t-1}^2 \dots \dots \dots 3.4$$

Equation 3.3 represents a function of the variables with the error term where,

w is the constant

ε_{t-1}^2 (ARCH term) represents the volatility level based on the prior time period and was operationalized as the lag of squared mean residuals.

σ_t^2 is conditional variance (a period ahead of forecast variance on the basis of past information)

The existence of the first order moving average ARCH model and first order autoregressive GARCH model is represented by the (1,1). In the form of GARCH (0,1), an ARCH model is a specific instance of the GARCH specification.

When moving σ_t^2 is added to the right-hand side and the lagged ε_t^2 terms to both sides of equation 3.4, the new equation would be an ARMA(1,1) process for the squared errors written as

$$\varepsilon_t^2 = \alpha_0 + (\alpha_1 + \beta_1) \cdot \varepsilon_{t-1}^2 + v_t - \beta_1 \cdot v_{t-1} \dots \dots \dots 3.5$$

where $v_t = \varepsilon_t^2 - \sigma_t^2$.

If $\alpha_1 + \beta_1 < 1$, unconditional estimate of ε_t is constant and GARCH (1,1) would be viewed as stationary in variance given by,

$$var(\varepsilon_t) = \frac{\alpha_0}{1 - (\alpha_1 + \beta_1)} \dots \dots \dots 3.6$$

If $\alpha_1 + \beta_1 \geq 1$, then the unconditional estimate of ε_t is not defined meaning non-stationarity in variance. However, if $\alpha_1 + \beta_1 = 1$, it implied a unit root in variance (IGARCH)

The independent variables that are perceived to affect stock price volatility was inflation, interest rate, money supply, exchange rate, oil prices, Treasury Bill Rate, economic growth; government debt and market capitalization. The study narrowed down to inflation, economic growth and exchange rate.

Table 3.1: Measurement, Variables Definition and Expected Output

	Variable	How the variable was measured	Expected sign	Data sources
Dependent Variable	Stock Price volatility	Standard Deviation of a stock's annualized returns over a given period		NSE
Independent Variable	Inflation Rate	Consumer price index	+ve	WDI
Independent Variable	Exchange rate	Annual KES exchange against US dollar		WDI
Independent Variable	Economic growth	This is the aggregate value of goods and services produced in a country at a point in time or over a period. To obtain the growth rate, annual GDP growth in % was used.	-ve	WDI

3.5 Data Source

Time series data covering the period 1990 to 2020 would be utilized and would be sourced from, WDI, Nairobi Securities (NSE) reports and Central Bank of Kenya (CBK).

3.6 Data analysis

Eviews Software was utilized in analyzing the secondary data collected. The analysis of data entailed inferential and descriptive statistics. The Skewness and Kurtosis, maximum and minimum as well as the means and deviations from the mean formed part of the descriptive results. Inferential statistics entailed time series models to establish the correlation between inflation rate and stock market volatility at NSE. A 95% confidence interval was adopted in the interpretation of model significance.

3.7 Pre-Estimation Tests

3.7.1 Stationarity Test

The basic assumption of time series data is that of stationarity. Thus, before carrying out model estimation, it is essential to test for the stationarity of data to be used in model estimation. If the data is found to be non-stationary, then incorrect estimates of the study parameters would be found. On the other hand, spurious model estimates would be found if stationarity is not accounted for. The test was conducted on all the study variables. Differentiation or lagging was done on data variables that are non-stationary. If all the data were stationary at level, ordinary least squares model was employed. However, if the data variables contain both stationary and non-stationary, ARDL model is employed.

3.8 Post estimation Tests

This included heteroscedasticity, serial correlation and normality tests.

3.8.1 Heteroscedasticity

The study made use of Breusch-Pagan/Godfrey test to carry out this test. The H_0 was homoscedasticity of the error variance. Upon carrying out the test, the study may reject or fail to reject H_0 . If H_0 is rejected, the conclusion would be the existence of heteroscedasticity in the data set and further tests would be done by estimating an FGLS model. If from the outcomes, $p\text{-value} > 0.05$, there is no Heteroscedasticity.

3.8.2 Serial correlation

The test for serial correlation essentially looks at the correlation of the error terms across periods of time. There could be correlation of error terms at second order (AR2) or at first order (AR1). The study utilized Breusch-Godfrey Serial Correlation LM Test. As a rule of thumb, if the $p\text{-value} < 0.05$, then the results would depict the presence of serial autocorrelation which necessitated the lagging of the dependent variable.

3.8.3 Normality Tests

The test for normality checks on the distribution of residuals whether they follow normal distribution or not (Zahediasl & Ghasemi, 2012). Jarque-Bera test (Bera and Jarque, 1982) was utilized in the assessment. The normality test null hypothesis is that residuals do not follow a normal distribution. In making decision, if the estimated significance value is > 0.05 , the study would reject this null hypothesis suggesting that residuals follow a normal distribution at 95% significance interval. The hypothesis that the data is not normal was tested in this investigation. H_0 is rejected if the computed $p\text{-value}$ is greater than 0.05. Non-parametric tests are typically thought to be appropriate for data that do not follow normal distribution.

CHAPTER FOUR: DATA ANALYSIS, DISCUSSION AND INTERPRATION

4.1 Introduction

The data analysis, discussion as well the interpretation of outcomes is outlined in the chapter. The chapter presentation is done in accordance with the objectives which were to determine the level of stock market volatility and the correlation (positive/negative) between inflation rate and volatility of stock prices as well as the degree of correlation (high, low, medium) between inflation rate and volatility of stock at NSE. The main outcomes are presented in the form of descriptive results detailing the minimum, maximum values, the Standard Deviation, and the Mean of the various variables in the study. The variables were stock prices volatility, which was the predictor factor and inflation rate, exchange rate, and economic growth as the predictor elements.

4.2 Descriptive Results

This part outlines the descriptive results of the research including maximum, minimum values, the standard deviation as well as the mean of the various study variables. From the results, the mean value for stock price volatility was 16.9544 whereas its standard deviation was 4.8292 implying that over the period of study, there were variations in the volatility of stock prices at the NSE. Furthermore, the minimum value for stock volatility over the period of study was 10.117 whereas the maximum value was 26.78. The values imply that there were fluctuations of the aggregate value of stock prices at the NSE.

The descriptive results for the inflation rate indicated that the minimum and maximum values were 3.96139 and 45.9789 in that order. This is an indication that over the period under review (1990-2022), the inflation rates in Kenya fluctuated. In addition, the mean value for inflation was 15.312 and its standard deviation was 8.90837 implying that there was variation in the rates of inflation in Kenya over the period under review.

The mean value for exchange rate was 79.6636 whereas its standard deviation was 25.7719 implying that over the period of study, there were variations in the exchange rates in Kenya. Furthermore, the minimum value for exchange rates over the period of study was 22.915 whereas the maximum value was 123.563. The values imply that there were fluctuations of the exchange rates in Kenya.

Descriptive output for the growth of the economy indicated that the minimum and maximum values were -0.7995 and 8.05847 respectively. This is an indication that over the period under review (1990-2022), the economic growth in Kenya fluctuated. In addition, average economic growth was 3.65711 and its standard deviation was 2.31381 implying that there was variation in the growth of the economy in Kenya over the period under review.

Table 4.1: Descriptive Results

Variable	Obs	Mean	Std. Dev.	Min	Max
Stock Price volatility	33	16.9544	4.8292	10.117	26.78
Inflation	33	15.312	8.90837	3.96139	45.9789
Exchange Rate	33	79.6636	25.7719	22.915	123.563
Economic growth	33	3.65711	2.31381	-0.7995	8.05847

4.3 Correlation Results

The study further conducted a correlation test to assess the strength and direction of correlation between the dependent and the independent study variables. The direction of correlation could be negative correlation or positive correlation. The study employed Pearson correlation analysis to ascertain the degree and direction of connection between the variables under investigation. The range of values for the correlation coefficient is -1 to +1. Generally speaking, coefficient values more than 0.7 indicate a very high correlation, those between 0.5 and 0.7 depicts a strong correlation, those between 0.3 and 0.5 indicate a moderate correlation, and those below 0.3 indicate a weak correlation (Dănciă, 2017). The correlation results are outlined in Table 4.2. From the results, stock price volatility and inflation rate were positive, moderately strong and statistically significantly correlated ($\beta = 0.5679$, $p = 0.0006 < 0.05$). This implies that inflation rate is a predictor of volatility of stock. The association between stock price volatility and exchange rate was negative, moderately strong and significant statistically ($\beta = -0.5668$, $p = 0.0006 < 0.05$). The result signifies that exchange rate is a significant predictor of stock price volatility. Correlation between stock price volatility and economic growth was negative, weak and statistically insignificant ($\beta = -0.2127$, $p = 0.2347 > 0.05$). This means that economic growth is an insignificant determinant of stock price volatility.

Table 4.2: Correlation Results

	Stock Volatility	Price Inflation Rate	Exchange Rate	Economic Growth
Stock Volatility	1			
Inflation Rate	0.5679 0.0006	1		
Exchange Rate	-0.5668 0.0006	-0.5426 0.0011	1	
Economic Growth	-0.2127 0.2347	-0.4985 0.0031	0.3216 0.068	1

4.4 Pre-Estimation Tests

4.4.1 Stationarity Test

The basic assumption of time series data is that of stationarity. Thus, before carrying out model estimation, it is essential to test for the stationarity of data to be used in model estimation. If the data is found to be non-stationary, then incorrect estimates of the study parameters would be found. On the other hand, spurious model estimates would be found if stationarity is not accounted for. Differentiation or lagging was done on data variables that were non-stationary. If all the data would be stationary at level, ordinary least squares model was employed. However, if the data variables contain both stationary and non-stationary, ARDL model is employed. Table 4.3 highlights the stationarity test output.

Table 4.3: Results for Stationarity Test

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	MacKinnon approximate p-value for Z(t)
Stock price					
volatility	-4.097	-3.702	-2.98	-2.622	0.001
Inflation	-4.176	-3.702	-2.98	-2.622	0.0007
Exchange					
Rate	-3.124	-3.702	-2.98	-2.622	0.0249
Economic					
growth	-4.405	-3.702	-2.98	-2.622	0.0003

As per the results above, the p-value for stock volatility, inflation, exchange rate and economic growth were >0.05 . Thus, the data variables were stationary hence no differencing was required.

4.5 ARCH Model

The ARCH regression was undertaken to investigate the nexus that exist between inflation, economic growth and exchange rate and stock price volatility. The findings are outlined in Table 4.4

Table 4.4: Regression Output

Stock Price Volatility	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
Inflation	0.22975	0.09304	2.47	0.014	0.0474 0.4121
Exchange Rate	-0.0703	0.02944	-2.39	0.017	-0.128 -0.0126
Economic growth	0.24888	0.31777	0.78	0.434	-0.3739 0.87169
_cons	18.1267	3.65402	4.96	0.000	10.9649 25.2884
Wald chi2(3)	24.69				
Prob>chi2	0.000				

From the results, inflation rate was both positive and significant statistically ($\beta = 0.22975$, $p = 0.014 < 0.05$) implying that unit improvement in the rate of inflation in Kenya results in a significant improvement in the volatility of stock prices in the Nairobi Stock Exchange. This means that inflation is critical in giving explanations on the volatility of stock returns at NSE.

As per the outcomes, the coefficient of exchange rate was both negative and statistically significant ($\beta = -0.0703$, $p = 0.017 < 0.05$) implying that unit improvement in the exchange rate in Kenya affects significantly negatively the stock price volatility in the Nairobi Stock Exchange. Thus, the exchange rate is a significant predictor of the stock volatility at NSE.

Furthermore, the coefficient of economic growth was positively and significantly related ($\beta = 0.24888$, $p = 0.434 < 0.05$). This implies that a unit improvement in the growth of the economy in Kenya results in an insignificant improvement in the stock price volatility in the NSE. Thus, the rate of inflation is an insignificant in explaining stock price volatility in the NSE.

4.6 Discussion

The first aim was to assess the level of stock market volatility at the NSE. From the results, the mean value for stock price volatility was 16.9544 whereas its standard deviation was 4.8292 implying that over the period of study, there were variations in the volatility of stock prices at the NSE. Furthermore, the minimum value for stock volatility over the period of study was 10.117 whereas the maximum value was 26.78. The values imply that there were fluctuations of the overall value of stock prices at the NSE. Volatility entails the randomness or changeability of prices of assets. A change in the volatility of the prices of shares may be caused by changes in the

volatility of future discount rates or cash flows. Volatility of stock markets entails the measure of the changes of the overall value of a particular stock market (Othman et al., 2020). Stock volatility can be occasioned by varied economic, industry, political or social factors including changes in the trends of inflation, sector and industry factors, exchange rates, interest rates, oil prices, money supply among others (Aziz et al., 2020). The unexpected rise or fall in the stock market prices leads to uncertainties in the investor returns on their investments in stocks. Thus, investors are always keen on trend direction of the values of stock market (Bloom, 2014). The trends in the Kenyan market stock volatility indicates that between 2002 and 2003, there was an improvement in the market capitalization among the companies listed at NSE. However, between 2003 and 2004, the market capitalization of the companies under review remained unchanged and further saw an improvement between 2004 and 2010. Between 2012 and 2018, the market capitalization of the companies listed at NSE remained largely constant. However, it improved between 2019 and 2020 and saw a slight decline between 2020 and 2022. Generally, over the period of study, the listed companies saw an improvement the market capitalization implying that the value of the stocks for the companies saw an improvement during the period under study.

The second objective sought to investigate the correlation (positive/negative) between inflation rate and volatility of stock prices at NSE. From the findings, the correlation between stock price volatility and inflation rate was positive, moderately strong, and statistically significant ($\beta = 0.5679$, $p = 0.0006 < 0.05$). The results imply that inflation rate is a significant predictor of stock price volatility. Volatility involves the randomness or changeability of prices of assets. A change in the volatility of the prices of shares may be caused by changes in the volatility of future discount rates or cash flows. Volatility of stock markets entails the measure of the changes of the overall value of a particular stock market (Othman et al., 2020). Inflation entails general rise in the prices of commodities and services because of currency devaluation. High inflation rates occurs when unexpected prices of commodities occur. Inflation reduces the purchasing power but maybe a good thing to entrepreneurs. If inflation occurs and incomes remain unchanged, the purchasing power of everyone is effectively reduced leading to slow or stagnant economy (Girdzijauskas et al., 2022). High inflation also causes uncertainty, which may ultimately lead to a slowdown in the economic activities of a particular economy. Inflation is categorized as expected inflation and unexpected inflation. When inflation rises, the nominal stock returns as well as the nominal dividend payments should also rise implying that nominal stock returns and inflation move in similar direction. It is however, imperative to note that there has not been consensus in the academic literature on how inflation affects stock market (Sathyanarayana & Gargesa, 2018). Short-run and long run impacts of inflation on the price of stocks and a detrimental effect of both negative and positive changes on the prices of stocks. As per the results, it is the expectation that the stock prices would behave independent of the rates of inflation. However, inflation impacts on stock prices depends on the capability of the investor in hedging as well as the inherent monetary policies inherent within an economy. Spiraling inflation rates is linked to smaller equity markets and less liquid (Sia et al., 2023).

Objective three investigated the degree of correlation (high, low, medium) between inflation rate and volatility of stock at NSE. From the outcomes, the correlation between stock price volatility and inflation rate was moderately strong and statistically significant ($\beta = 0.5679$, $p = 0.0006 < 0.05$). The results imply that inflation rate is a significant predictor of stock price volatility. In cases where investors are anticipating economic slowdown and unprecedented rise in the price of commodities and services, there would be a tendency to sell stocks and thus based on these evidences, inflation have negative correlation with stock market prices (Chiang & Chen, 2023). According to Sia et al. (2023), short-run and long run impacts of inflation on the price of stocks and a detrimental effect of both negative and positive changes on the prices of stocks. However, it is the expectation that the stock prices would behave independent of the rates of inflation. Inflation impacts on stock prices dependents on the capability of the investor in hedging as well as the inherent monetary policies inherent within an economy. Sathyanarayana and Gargesa (2018) indicated that high inflation affects the economy because of the uncertainties it creates as well as stock market volatility that is high. As compared to the expected inflation, the unexpected inflation poses a threat to the stock price volatility. In cases when investors are expecting a rise in the rates of inflation, they are likely to exchange their financial assets with real assets. Thus, the prices of stocks tend to react to the prevailing information on the economic variables including inflation. It is therefore evident from the demonstration that inflation rates and equity stocks negatively relate considering the Uganda Securities Exchange (Hussein, 2017).

4.7 Post Estimation Tests

4.7.1 Heteroscedasticity Test

The study made use of Breusch-Pagan/Godfrey test to carry out this test. The H_0 would be homoscedasticity of the error variance. Upon carrying out the test, the p value of the results was $0.0012 < 0.05$ and a relatively small chi2. The study thus rejected H_0 implying the presence of heteroscedasticity in the data set. The presence of heteroscedasticity was corrected by estimating the FGLS model. The results are outlined in Table 4.5.

Table 4.5: Heteroscedasticity Test Results

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity	
Ho: Constant variance	
Variables: fitted values of Stock Price Volatility	
chi2(1)	= 10.44
Prob > chi2	= 0.0012

4.7.2 Serial Correlation

The tests for serial correlation essentially checks the correlation of the error terms across periods of time. There could be correlation of error terms at second order (AR2) or at first order (AR1).

The study utilized Breusch-Godfrey Serial Correlation LM Test. As a rule of thumb, if the p -value < 0.05 , then the results would depict the presence of serial autocorrelation which would necessitate the lagging of the dependent variable. From the results, the estimated F statistics was 1.622 and the significance value was $0.202 > 0.05$. The study thus fails to reject the null hypothesis and concludes that that serial correlation does not exist on the error terms over the period under review.

Table 4.6 Serial Correlation Test results

Serial autocorrelation Test
H ₀ : no first-order autocorrelation
F(2, 29) = 1.622
Prob > F = 0.202

4.7.3 Normality Tests

The tests for normality checks on the distribution of residuals whether they follow normal distribution or not (Zahediasl & Ghasemi, 2012). Jarque-Bera test (Bera and Jarque, 1982) was utilized in the assessment. The normality test null hypothesis is that residuals do not follow a normal distribution. In making decision, if the estimated significance value is > 0.05 , the study would reject this null hypothesis suggesting that residuals follow a normal distribution at 95% significance interval. The hypothesis that the data is not normal was tested in this investigation. H₀ is rejected if the computed p-value is greater than 0.05. Non-parametric tests are typically thought to be appropriate for data that do not follow normal distribution. From the results, the p values for the study variables were all > 0.05 ($0.253 > 0.05$, $0.562 > 0.05$, $0.2099 > 0.05$ and 0.571).

Table 4.7: Normality Test Results

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
Stock Price Volatility	33	0.2564	0.2644	2.75	0.253
Inflation Rate	33	0.0876	0.732	1.17	0.562
Exchange Rate	33	0.0935	0.81	3.12	0.2099
Economic Growth	33	0.5177	0.4245	1.12	0.571

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Introduction

The section presents an outline of the summary of the key results of the study, the conclusions drawn from these results as well as the study policy recommendations. The section is presented in accordance with the objectives which were to find out the level of stock market volatility and the correlation (positive/negative) between inflation rate and volatility of stock including the degree of correlation (high, low, medium) between rate of inflation and volatility of stock market at the NSE.

5.2 Summary

The first goal was to find out the level of stock market volatility at NSE. The mean value for stock price volatility was 16.9544 whereas its standard deviation was 4.8292 implying that over the period of study, there were variations in the volatility of stock prices at the NSE. Furthermore, the minimum value for stock volatility over the period of study was 10.117 whereas the maximum value was 26.78. The values imply that there were fluctuations of the overall value of stock prices at NSE. Volatility entails the randomness or changeability of prices of assets. A change in the volatility of the prices of shares may be caused by changes in the volatility of future discount rates or cash flows. Stock volatility can be occasioned by varied economic, industry, political or social factors including changes in the trends of inflation, sector and industry factors, exchange rates, interest rates, oil prices, money supply among others. The unexpected rise or fall in the stock market prices leads to uncertainties in the investor returns on their investments in stocks. Thus, investors are always keen on trend direction of the values of stock market.

The second aim was to investigate the correlation (positive/negative) between inflation rate and volatility of stock prices at the NSE. Stock price volatility and inflation rate correlation was positive, moderately strong and statistically significant ($\beta = 0.5679$, $p = 0.0006 < 0.05$). The results imply that inflation is a statistical predictor of stock price volatility. Volatility involves the randomness or changeability of prices of assets. A change in the volatility of the prices of shares may be caused by changes in the volatility of future discount rates or cash flows. Volatility of stock markets entails the measure of the changes of the overall value of a particular stock market. Inflation entails general rise in the prices of commodities and services because of currency devaluation. High inflation rates occurs when unexpected prices of commodities occur. Inflation reduces the purchasing power but maybe a good thing to entrepreneurs. If inflation occurs and incomes remain unchanged, the purchasing power of everyone is effectively reduced leading to slow or stagnant economy. High inflation also causes uncertainty, which may ultimately lead to a slowdown in the economic activities of a particular economy. Short-run and long run impacts of inflation on the price of stocks and a detrimental effect of both negative and positive changes on the prices of stocks. As per the results, it is the expectation that the stock prices would behave independent of the rates of inflation. However, inflation impacts on stock prices depends on the capability of the investor in hedging as well as the inherent monetary policies inherent within an economy. Spiraling inflation rates is linked to smaller equity markets and less liquid.

Finally, objective three investigated the degree of correlation (high, low, medium) between inflation rate and volatility of stock at the NSE. From the results, the correlation between stock price volatility and inflation rate was moderately strong and statistically significant ($\beta = 0.5679$, $p = 0.0006 < 0.05$). The results imply that inflation significantly affects stock price volatility. In cases where investors are anticipating economic slowdown and general rise in the price of commodities and services, there would be a tendency to sell stocks and thus based on these evidence, inflation have negative correlation with stock market prices. It is the expectation that the stock prices would behave independent of the rates of inflation. Inflation impacts on stock prices depends on the capability of the investor in hedging as well as the inherent monetary policies inherent within an economy. High inflation affects the economy because of the uncertainties it creates as well as stock market volatility that is high. In cases when investors are expecting a rise in the rates of inflation, they are likely to exchange their financial assets with real assets. Thus, the prices of stocks tend to react to the prevailing information on the economic variables including inflation.

5.3 Conclusion

The study makes the conclusion that stock market volatility has been witnessed at the Nairobi Securities Exchange. It was evident that throughout the period under review, there were variations in the stock market volatility. The values imply that there were fluctuations of the overall value of stock prices at the NSE. Stock volatility entails the randomness or changeability of prices of assets. A change in the volatility of the prices of shares may be caused by changes in the volatility of future discount rates or cash flows. Stock volatility can be occasioned by varied economic, industry, political or social factors including changes in the trends of inflation, sector and industry factors, interest rates, money supply, exchange rates, oil prices, among others.

The study further concludes based on the results that the correlation between stock price volatility and inflation rate was positive, moderately strong, and statistically significant. This implies that inflation rate significantly impacts stock price volatility. Volatility involves the randomness or changeability of prices of assets. High inflation also causes uncertainty, which may ultimately lead to a slowdown in the economic activities of a particular economy. Short-run and long run impacts of inflation on the price of stocks and a detrimental effect change on the prices of stocks.

The study finally makes the conclusion that the correlation between stock price volatility and inflation rate was moderately strong and statistically significant. This implies that inflation rate is a significant predictor of stock price volatility. In cases where investors are anticipating economic slowdown and unprecedented increase in the prices of commodities and services, there would be a tendency to sell stocks and thus based on these evidence, inflation have negative correlation with stock market prices. It is the expectation that the stock prices would behave independent of the rates of inflation. High inflation affects the economy because of the uncertainties it creates as well as stock market volatility that is high. In cases when investors are expecting a rise in the rates of inflation, they are likely to exchange their financial assets with real assets. Thus, the prices of stocks tend to react to the prevailing information on the economic variables including inflation.

5.4 Policy Recommendations

The made the recommendation that the government via the monetary policy committee of the central bank ought to revise its interest rates less frequently and that the changes in the interest rates should be minimal. This would be significant in stabilizing inflation rates. In addition, the government ought to come up with policies including introduction of subsidies that would tame the rising prices of some products and hence tame the rates of inflation, which would subsequently stabilize the stock market.

5.5 Suggestions for Further studies

Future studies may focus on interest rates and stock market volatility, a case of NSE with money supply, oil prices, Treasury Bills and Government debt as the control variables.

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