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FINANCIAL DERIVATIVES AND MOBILE TRADING PLATFORMS' EFFECTS ON STOCK MARKET VOLATILITY IN KENYA

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ABSTRACT

Purpose of the study: The overall objective of this study was to examine the effect of financial innovation on stock market volatility in Kenya.

Short introduction of problem statement: Although financial innovation has enhanced market access and diversification, it has also introduced new dynamics associated with speculative trading, rapid transactions, and changing investor behaviour, which may affect market stability. The increasing adoption of derivatives and mobile trading platforms at the NSE has coincided with more complex volatility patterns, raising concerns about whether these innovations stabilize the market through risk management or amplify instability through excessive risk-taking and herd behaviour. Despite this, there remains limited and inconclusive empirical evidence on their individual and combined effects on stock market volatility within the Kenyan context. Therefore, this study sought to address this gap by analysing the extent to which financial derivatives and mobile trading platforms influence stock market volatility, with the aim of providing evidence to inform policy, regulation, and risk management in Kenya's capital markets.

Method/methodology: The study adopted a non-experimental time series design to analyze the relationship between financial innovations and stock market volatility at the NSE. The essence of the study was to examine the effects that derivatives trading and mobile platform adoption had on stock market volatility across the NSE sector. The approach was broader to allow analysis of volatility patterns in Kenya, thereby avoiding sectoral bias. A time series econometric approach was also employed to analyze market-wide volatility patterns through aggregate trading data, with a focus on volatility clustering effects in financial markets in Kenya. The study used secondary data on the values of the NSE 20 Share Index and the NSE

25 Share Index and the volume of derivatives traded from 2019 to 2024 from the Nairobi Securities Exchange while data on the number of trading accounts opened monthly and accounts that trade monthly for the same period was obtained from The Central Depository & Settlement Corporation Limited.

Results of the study: The study found that increased derivatives trading activity leads to greater price changes which occur because traders engage in both speculative and hedging practices. The research demonstrated that mobile trading platforms create a major impact on stock market fluctuations. The market participation of retail investors has increased because mobile trading provides them with easy access and convenient trading options which results in more trading activity and short-term price changes. The study found that derivatives trading and mobile trading together create a combined effect which results in greater market volatility. The study results showed that market volatility shows strong persistence because market shocks continue to affect the market for an extended time.

Conclusion and policy recommendation: The study concludes that financial innovations significantly impact stock market volatility in Kenya. The study recommends that financial innovation policies should match actual market behaviour to create a framework which enables innovation while controlling its impact on market fluctuations.

Keywords: *Stock Market Volatility, Financial Innovation, Kenya*

1. INTRODUCTION

Financial innovation has transformed global financial markets through the introduction of new technologies, financial instruments, and trading practices that improve market efficiency and accessibility. According to Tufano (2003), financial innovation involves the adoption of new financial technologies, institutions, and practices that reshape financial services and investment decisions. In Kenya, innovations such as mobile money services like M-PESA, digital lending platforms, blockchain-based financial products, and automated trading systems have significantly changed the financial landscape (Ngugi & Kabiru, 2021). These developments have not only enhanced financial inclusion and market participation but have also raised concerns regarding their influence on stock market volatility, making the relationship between financial innovation and market stability an important area of research.

Stock market volatility reflects fluctuations in stock prices and investor sentiment and is widely used as an indicator of market risk. Volatility is commonly measured using the standard deviation of portfolio returns and plays a critical role in financial decision-making, risk management, and market stabilization (Abdalla & Winker, 2012; Hongyu & Zhichao, 2006). The increasing integration of financial technologies into capital markets has intensified scholarly and policy interest in understanding how innovations influence market behaviour (Schmitt & Westerhoff, 2017). To analyse time-varying market fluctuations, financial researchers frequently employ econometric models such as the Autoregressive Conditional Heteroskedasticity (ARCH) model developed by Engle (1982) and the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model introduced by Bollerslev

(1986). These models provide valuable insights into the dynamic relationship between financial innovation and stock market volatility.

Financial innovation can broadly be categorized into product, process, and institutional innovations (Frame & White, 2014; Oslo Manual, 2018). This study specifically focuses on product innovations such as derivatives and process innovations including mobile trading platforms, both of which are increasingly shaping trading behaviour and market dynamics at the Nairobi Securities Exchange (NSE). While derivatives support risk hedging and portfolio diversification, they may also increase speculative activity and market risk during periods of financial instability (Bouri et al., 2018). Similarly, mobile trading platforms, algorithmic trading, and other digital financial technologies improve market efficiency and accessibility but may contribute to rapid price fluctuations and heightened volatility (Hariri et al., 2019). Given the rapid growth of fintech and digital finance in Kenya, there is a need for comprehensive empirical research to examine how these financial innovations influence stock market volatility in emerging markets such as the NSE.

Evolution of the Nairobi Security Exchange Derivative Market

The Nairobi Securities Exchange launched the derivatives market in July 2019 to expand Kenya's financial infrastructure, diversify investment opportunities, and introduce advanced risk management tools for investors. The market initially introduced single-stock futures for major blue-chip companies such as Safaricom, Equity Bank, East African Breweries Limited, Kenya Commercial Bank, and British American Tobacco. Despite growth in turnover from KES 20.7 million in 2019 to KES 44.7 million in 2020, market uptake remained low due to limited investor awareness and the high capital requirements for futures contracts, which excluded many retail traders. To address this challenge, the NSE introduced Mini Index Contracts in 2021, significantly reducing capital requirements and opening the derivatives market to retail investors. This intervention led to a sharp increase in market activity, with turnover rising to approximately KES 324 million and contracts increasing to nearly 8,000, reflecting growing investor participation and a shift toward structured risk management and portfolio hedging.

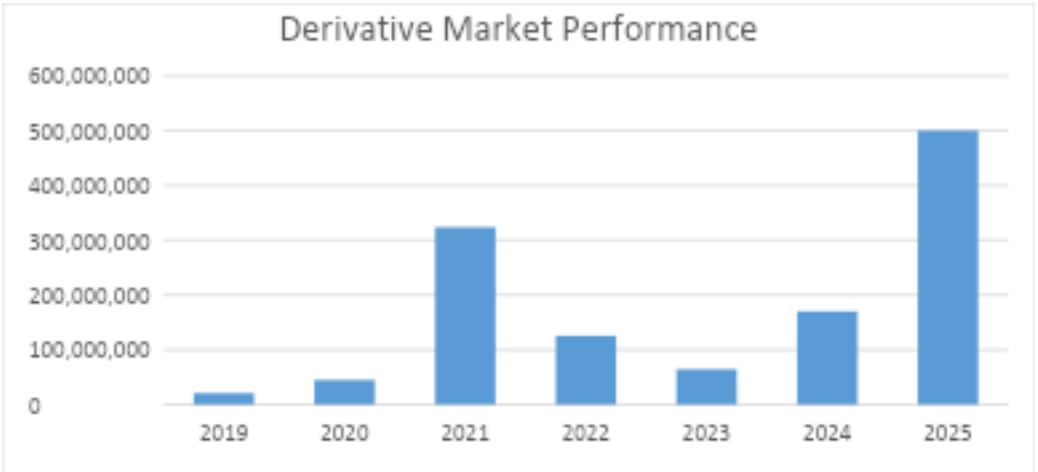

Figure 1.1: Bar Graph Showing the Total Turnover in Kenya's NSE Derivative Market

However, the derivatives market experienced a decline in turnover in 2022 and 2023 due to the economic uncertainty caused by the COVID-19 pandemic, which weakened investor confidence and reduced market participation. Market turnover later recovered in 2024, with projections indicating continued growth as a result of increased investor education, inclusion of additional stocks in the futures market, and reduced government dominance in the securities market. The expansion of mobile trading platforms has further enhanced financial inclusion by increasing participation from both institutional investors and micro-traders, narrowing the gap between large and small investors in the Kenyan securities market. Overall, the evolution of Kenya's derivatives market demonstrates growing investor appetite for derivative securities while also highlighting the sensitivity of the market to macroeconomic uncertainty. The COVID-19 period, in particular, revealed that investors may quickly withdraw from perceived risky markets during periods of instability, emphasizing the dual role of derivatives as both risk management tools and potential sources of increased market exposure.

Stock Market Volatility in Kenya

Over the past two decades, the Nairobi Securities Exchange has played a central role in Kenya's financial system, experiencing substantial growth and modernization while remaining highly vulnerable to both internal and external shocks. Historical evidence shows that the NSE is particularly sensitive to periods of political instability and global economic downturns. For instance, during the 2007/2008 post-election violence, the NSE 20-Share Index dropped sharply, wiping out billions in market value as investor panic and capital flight intensified. Similarly, during the COVID-19 pandemic in 2020, listed firms experienced significant losses in market capitalization as economic activity slowed, supply chains were disrupted, and investor confidence weakened. These episodes highlight the structural fragility of the Kenyan stock market and emphasize the importance of strengthening market stability through better policy frameworks and improved understanding of volatility drivers.

In recent years, the rise of mobile trading platforms and digital financial technologies has further transformed market participation in Kenya, making trading more accessible while also introducing new sources of risk. Innovations such as algorithmic trading, high-frequency trading, and mobile-based investment platforms have increased liquidity and participation, particularly among retail investors, but have also been associated with heightened short-term volatility and rapid price fluctuations (Gomber et al., 2018; Hariri et al., 2019). Financial innovation, including products such as derivatives, can therefore have a dual effect by both enhancing risk management and potentially amplifying market instability, especially during periods of economic stress (Bouri et al., 2018). In emerging markets like Kenya, these mixed effects underscore the need for rigorous empirical analysis to determine how financial innovations influence stock market behaviour. Such evidence is essential for policymakers and regulators seeking to balance the benefits of innovation with the need to maintain a stable and efficient capital market that supports long-term economic development.

2. STATEMENT OF THE PROBLEM

Based on the above information, this study was informed by the need to empirically examine how financial derivatives and mobile trading platforms influence stock market volatility in Kenya. Although financial innovation has enhanced market access and diversification, it has

also introduced new dynamics associated with speculative trading, rapid transactions, and changing investor behaviour, which may affect market stability. The increasing adoption of derivatives and mobile trading platforms at the NSE has coincided with more complex volatility patterns, raising concerns about whether these innovations stabilize the market through risk management or amplify instability through excessive risk-taking and herd behaviour. Despite this, there remains limited and inconclusive empirical evidence on their individual and combined effects on stock market volatility within the Kenyan context. Therefore, this study sought to address this gap by analysing the extent to which financial derivatives and mobile trading platforms influence stock market volatility, with the aim of providing evidence to inform policy, regulation, and risk management in Kenya's capital markets.

3. RESEARCH OBJECTIVES

The study's general objective was to examine the effect of financial innovation on stock market volatility in Kenya.

Specific Objectives

i. To examine the effect that derivatives have on stock market volatility at the NSE.

ii. To analyze the effect that mobile trading platforms have on stock market volatility at the NSE.

4. RESEARCH QUESTIONS

This study was guided by the following questions:

i. What is the effect that derivatives have on stock market volatility at the NSE?

ii. What is the effect that mobile trading platforms have on stock market volatility at the NSE?

5. THEORITICAL REVIEW

Efficient Market Hypothesis (EMH)

The Efficient Market Hypothesis (EMH) was put forth by Fama (1970) and states that asset prices in financial markets instantly and completely take into account all available information. The EMH is structured in three forms that include the weak form where prices reflect all historical trading information, the semi-strong form where prices reflect all information that is publicly available and the strong form where even insider information is presumed to be incorporated into asset prices. The EMH suggests that the market reacts instantly to news and data and ensures that no investor constantly generates excess returns using technical analysis or public information in an ideal situation.

EMH argues that the introduction of derivatives like futures and options, should improve price discovery and lower stock market volatility in terms of financial innovation when it comes to

the semi-strong form. Hedging and arbitrage are made possible by derivatives and should theoretically bring asset prices into line with their fundamental values and reduce overreaction to shocks. This stabilizing role of derivatives has been empirically supported in developed, liquid markets, for example, Figlewski (2019) found out in his study that better risk management and information efficiency led to approximately 20% less volatility in derivatives-linked ETFs in the US.

Shiller (2019) is among behavioural critiques of the EMH that contend that investor psychology such as emotions, narratives, and herd behaviour often prevails over logical decision-making when it comes to retail investors who use mobile platforms. Kenya has successful mobile-based retail trading that has led to more and more common and frequently driven by unofficial information channels like social media. EMH is vital because it offers a helpful theoretical foundation in this respect, but its applicability to the NSE depends on the effectiveness of regulations and market maturity. The notion that innovation inevitably results in efficiency needs to be re-examined given Kenya's structural constraints and investor behaviour.

The model has structural inefficiencies like thin liquidity, low investor expertise, and information asymmetry frequently cause the Efficient Market Hypothesis (EMH) to fail in emerging markets like Kenya despite offering a fundamental framework for understanding how prices reflect information (Claessens & Kodres, 2019). Claessens and Kodres state that prices at the NSE regularly deviate from fundamentals and innovations such as derivatives have not substantially increased depth or transparency (Ouma & Odongo, 2020; Kiragu, 2023). There is also speculative behaviour and low financial literacy as characteristics of mobile-based retail trading, which increase inefficiencies and reduce the explanatory power of the EMH (FSD Kenya, 2023; Barberis, 2021). Behavioural and microstructure points of view must be included in order to provide a more comprehensive explanation of how financial innovations impact volatility in these kinds of situations because of these constraints.

The EMH theory is important and applicable to this study since it explains how investors react to information and how this translates into price discovery, but the NSE presents a number of difficulties. The assumptions of semi-strong efficiency may be undermined by the features of Kenya's capital market that are typical of many emerging markets and include low liquidity, uneven investor sophistication and poor information dissemination. Ouma and Odongo (2020) argue that delayed reactions to news and informational asymmetries are common factors in Kenyan trading that encourage speculative activity and lessen the effectiveness of derivatives as tools of stabilization.

Noise Trading and Herding Behavior

Noise traders decide on non-fundamental data like the media, sentiment, or rumours rather than basing their decisions on objective data (Black, 1986). Currently, Kenya hosts phone-based market platforms like M-Akiba and PesaChap that have opened up access to the stock market but are believed to expose investors to a lot of erroneous information on social media platforms (Were & Wambua, 2022). This setting favours herding behaviour that is viewed to enhance market volatility by inducing investors to imitate other individuals' trades instead of conducting

independent research (Banerjee, 1992). Studies that have been conducted on local and international markets confirm that retail-driven herding can amplify short-term volatility substantially, particularly in illiquid exchanges like the NSE (Barber et al., 2023; FSD Kenya, 2023).

Displacement Theory

Displacement Theory was coined by Merton (1992) and argues that financial innovations that seek to redistribute or reduce financial risks frequently arise in response to inefficiencies in current systems. The theory cautions that innovations may unintentionally introduce new systemic vulnerabilities by redistributing risk into new markets or instruments. Derivatives were added to the NSE in Kenya to improve price discovery and deal with risk management. However, the limited institutional participation and shallow market depth of these instruments may have increased volatility as argued by Mugambi and Kithinji's (2021) regarding GARCH-based analysis. Baur and Dimpfl (2021) agree with Mugambi and Kithinji's (2021) by stressing that derivatives increase volatility rather than decrease it in illiquid markets like Kenya's. Therefore, their actual application is greatly impacted by the underlying market structure even though derivatives support Displacement Theory's goal of risk redistribution.

Market Microstructure Theory

O'Hara (1995) argues that Market Microstructure Theory looks at how trading mechanics like order flow, liquidity, transaction costs, and information asymmetry impact price formation and market volatility. Volatility is affected by information interpretation which is used in various trading environments even when it is publicly available. The changes in prices are slower and more seamless in markets with high levels of liquidity and transparency. On the other hand, price movements are believed to be more abrupt caused by fewer trades and larger bid-ask spreads in illiquid markets.

Kenya has had microstructural weaknesses in Kenya that has led the NSE to have limited institutional participation, low market depth and high retail investor concentration (NSE, 2022). Kiragu (2023) states that the introduction of derivatives did not immediately improve market depth; instead, it added complexity to an already fragile trading environment. Such volatility effects of financial innovations like derivatives are more pronounced than in mature markets. Ouma and Odongo (2020) also found out that limited liquidity at the NSE increases the impact of high-frequency or mobile trades on price swings.

The microstructural limitations mentioned are further interacted with by mobile trading platforms. They are found to cause fragment liquidity by increasing the frequency of small and speculative trades rather than large and institutional transactions even though they may increase access and decrease delays. The capacity of markets to withstand shocks is weakened by this fragmentation that increases short-term volatility. Theory shows that algorithmic and app-based trading can increase liquidity, but in low-depth markets like Kenya, the opposite frequently happens (Foucault and Moinas, 2021).

In conclusion, Market Microstructure Theory supports the claim that underlying market conditions act as a mediating factor when there is uneven effect of financial innovations on volatility. The market in Kenya is vulnerable to innovations like mobile trading and derivatives because of its structural inefficiencies, limited liquidity and increasing reliance on retail-driven trades.

6. EMPIRICAL REVIEW

Derivatives and Stock Market Volatility

Financial derivatives in emerging markets have ignited interest from scholars to learn how they influence stock market volatility. The impact that derivatives have varies depending on factors like liquidity, market structure, investor sophistication and regulatory oversight. A study that was conducted by Baur and Dimpfl (2021) involved a comprehensive meta-analysis that covered over 50 global exchanges. The study was able to show that volatility effects caused by derivatives depend on the liquidity of a market. Derivatives were found to reduce volatility since they support efficient price discovery. The study also showed that derivatives hedge in highly liquid environments. The study also showed that derivatives may amplify volatility due to speculative trading and limited counterparty depth when markets are not liquid. The problem is that derivatives do not account for the unique institutional, behavioral and structural features of frontier markets like Kenya though their analysis offers a broad international perspective.

An investigation was conducted by Kiprop et al. (2021) to understand the effect of agricultural futures on stock volatility that are related to agribusiness at the NSE in Kenya. They used Granger causality tests. They did so by using time-series data and found out that maize future contracts contributed to reduced volatility in the pricing of equities. The results suggested that derivatives that are sector-specific can serve as effective hedging tools for industries that are commodity-sensitive. The study had only focused on agricultural derivatives, but this study analyzed equity-based derivatives, including index futures, which offered a more comprehensive view of financial innovation in the Kenyan stock market.

The research that was conducted by Ngugi and Kabiru's (2022) utilized GARCH (1,1) analysis to assess the impact of equity index futures and market makers on NSE volatility dynamics in Kenya. It was discovered that the presence of market makers post-2021 led to a 7% reduction in market volatility by enhancing continuous liquidity provision. Their conclusion based on the findings was the stabilizing effect of institutional market participants in derivative markets in emerging economies. The gap created by the study emanates from its narrower focus on the general market level which did not disaggregate the effects across different stock categories. This has informed the current study exploring whether these observed benefits extend to small-cap stocks that often exhibit higher volatility caused by low trading volume and limited analyst coverage.

Vector Autoregression (VAR) model was used by Odhiambo (2022) in his study to evaluate the effect of forex derivatives on the volatility of cross-listed firms between the NSE and other regional markets. It was found that forex derivatives increase volatility due to exposure to

exchange rate risk and weak hedging practices among firms. The findings also indicated that cross-market volatility transmission shows that the systemic risks are introduced when derivatives are used without adequate financial infrastructure or expertise. The challenge of the study is that it does not include the effects that intra-market innovations have on derivatives within Kenya's domestic equity market even if it provides insights into external volatility spillovers. This study addressed the effect that financial innovation has on stock volatility at the NSE in the absence of currency risk.

A study that was conducted by Kiragu (2023) used high-frequency limit order book data to examine the microstructural effects of derivatives trading at the NSE in Kenya. It was discovered that the introduction of derivatives improves market depth and liquidity. It also found that derivatives increased short-term price volatility during the initial phase of adoption. The findings of the study highlight the transitional risks that are associated with the rollout of new financial instruments in thin markets. The study also reflected how volatility may behave non-linearly leading to a spike before being stabilized during the time of market participant adjustments. This current study built on this but used a longitudinal GARCH model to investigate whether these initial volatility spikes normalize over time.

Mobile Trading Platforms and Stock Market Volatility

There has been an increase in mobile trading platforms that have reshaped participation in capital markets. The effect of mobile trading on price volatility was studied by Aloo et al. (2020) who focused on intraday movements of Safaricom shares at the NSE. The study used ARIMA models and found that mobile app-driven trades amplified price fluctuations when earnings announcements were done. The effect was attributed to impulsive retail behaviour and information asymmetry caused by the challenge of accessing information from most apps by users. The study is important because it is regarded as the first one to link mobile technology to behavioural trading outcomes in Kenya. The study concentrated on a single blue-chip stock that limits its ability to generalize across the broader market, but the current study expands the scope by examining volatility patterns across a broader range of NSE-listed equities, including small-cap and mid-cap stocks.

Easley et al. (2021) used high-frequency U.S. trading data in analyzing the impact of retail platforms like Robinhood on the volatility of "meme stocks." The study found that these platforms contributed significantly to destabilizing price movements during speculative rallies driven by social media hype. The study showed the potential that mobile platforms have in serving as volatility amplifiers. The focus of the study was directed to high-volume U.S. equities, but this current research evaluated the phenomenon within the less liquid and more fragile NSE environment that adds a layer of local nuance to the global discourse on mobile trading's effects.

Biais and Foucault (2022) managed to develop a theoretical model to analyze how mobile trading affects liquidity and price stability in markets with limited institutional depth. Their study did not analyze a specific market as their model predicted that mobile trading enhances access and liquidity. This means that their study might undermine price discovery and increase

short-term volatility if left unregulated. The model assumed that mirror conditions were present at the NSE that include thin trading volumes and a growing retail base. Thus, the present study offered an empirical test of these hypotheses in a real-world frontier market setting.

Maina and Karugu (2022) studied Kenya's NSE by analyzing an order flow analysis to compare volatility on days dominated by mobile trading versus institutional block trades. The results of the study showed that days with high mobile trading activity recorded volatility levels nearly twice as high as those with dominant institutional participation. It was concluded that mobile platforms amplify short-term noise due to retail investors' tendency to overreact to intraday price changes. The study's methodology offers valuable insights into trade-based volatility drivers, but it does not disentangle whether the observed effects are due to platform design or user characteristics. The study addressed this gap by modelling the behavioral traits of mobile investors and how these interacted with broader market volatility trends.

Wambua and Musau (2023) provided a novel mixed-methods approach in Kenya that combined survey data with actual NSE trading records to assess the role of social networks in mobile-driven trading. Their study found that investor behavior was heavily influenced by online discussions in WhatsApp and Telegram groups that often lead to herd-like trading and resulting in intraday price spikes. The results suggested that social media and mobile trading platforms together create a feedback loop that intensifies volatility. The study did not incorporate formal econometric models to quantify the magnitude of these effects. This current study applied GARCH models to empirically measure the volatility clustering associated with mobile trading among retail investors on the NSE.

Lastly, Barber et al. (2023) analyzed retail trading behavior across several emerging markets during the COVID-19 recovery period and it was found that there is a clear association between increased mobile platform usage and stock market volatility. They used a cross-country panel analysis that revealed that markets with a higher proportion of app-based retail investors were more prone to sharp and short-term swings. This study aggregated data across diverse regulatory and institutional contexts, while it narrowed the focus to Kenya to allow for more specific policy recommendations tailored to the country's financial and technological infrastructure.

7. RESEARCH METHODOLOGY

A non-experimental time series design to analyze the relationship between financial innovations and stock market volatility at the NSE was adopted in this study. The approach was broader to allow analysis of volatility patterns in Kenya, thereby avoiding sectoral bias. A time series econometric approach was also employed to analyze market-wide volatility patterns through aggregate trading data, with a focus on volatility clustering effects in financial markets in Kenya.

Theoretical Model

The study used the Market Microstructure Theory to analyze the effect that emerging financial

technologies, such as derivatives and mobile trading platforms, had on price discovery and the volatility of prices in financial markets. It explained why prices were influenced not just by fundamental information but also by the process of trading itself. A simplified mathematical expression of the Market Microstructure model assumes that the observed price P_t is composed of two components as expressed bellow:

$$P_t = V_t + \mu_t \quad (3.1)$$

Where: The observed transaction price at time t is represented by P_t,

The fundamental value of the asset is represented by V_t, and

The pricing error due to microstructural noise is denoted by μ_t.

The modelling of the price changes are as follows:

$$\Delta P_t = \Delta V_t + \Delta \mu_t \quad (3.2)$$

The equation above assumed that the arrival of information is reflected in changes to the fundamental value (ΔV_t) and microstructure effects that are captured in ($\Delta \mu_t$) indicating the variance of price changes can be decomposed as follows:

$$Var(\Delta P_t) = Var(\Delta V_t) + Var(\Delta \mu_t) + 2Cov(\Delta V_t , \Delta \mu_t) \quad (3.3)$$

The equation above provides an indication that decomposition shows the volatility that arises from both fundamental information shocks and trading frictions. It also shows that in markets where innovation changes the structure of trading through new instruments or trading technologies which the component $Var(\Delta \mu_t)$ becomes more prominent.

The equation also suggests that the theory under order flow proxies the intensity and direction of trading activity. It also shows that it provides a measurable impact on volatility. This relationship is often modelled as:

$$Var(P_t) = \alpha + \beta V_t + \mu_t \quad (3.4)$$

where: The net order flow or trading volume at time *t* is represented by Q_t,

The baseline variance is represented by α,

The sensitivity of price variance to order flow is represented by β; and

The random error is represented by Ɛ.

The framework highlighted that increased trading activity could increase price volatility, depending on factors such as regulation, market depth, and liquidity provision. Financial innovations, such as derivatives and mobile trading platforms, increased the accessibility and speed of trading, introducing higher Q_t raising $Var(P_t)$ unless balanced by sufficient liquidity

and informed trading. This theoretical structure was used as the basis for modelling volatility as a function of previous volatility, past shocks, and innovation-related trading activity in the subsequent empirical model.

Empirical Model

The empirical framework used in this study was based on Market Microstructure Theory, which holds that innovations in trading mechanisms can have a profound impact on market behaviour by changing order flow, price discovery, and liquidity. Bhaumik and Bose's (2009) developed framework, which is well suited for estimating time-varying volatility characteristics inherent in financial markets, was used in this study. This approach aligned with the fundamental assumptions of Market Microstructure Theory regarding information dissemination and trader behaviour.

The Autoregressive Conditional Heteroskedasticity (ARCH) model was introduced by Engle in 1982 and later expanded into the Generalized ARCH (GARCH) framework by Bollerslev in 1986. These models assumed that volatility is mean-reverting and time-varying, often clustering around significant financial or economic events. GARCH models were relevant in contexts where volatility tended to persist due to lower liquidity and external shocks in emerging economies like Kenya. The application of GARCH techniques on data from the NSE showed that increased volatility clustering was related to derivatives and mobile trading events (Mugambi & Kithinji, 2021). Such results supported the use of GARCH models in monitoring how financial innovation affected market stability.

The GARCH (1,1) model comprises two core components which are the mean equation that captures the daily stock returns, and the variance equation, which models volatility conditional on past shocks and innovations.

Equation 3.1 specifies the mean equation:

$$r_t = \mu + \theta 1\ \text{DERIVATIVES}_t + \theta 2\ \text{MOBILE\_TRADING}_t + \varepsilon_t \qquad (3.5)$$

where: r_t denotes daily log returns at time t, μ is the constant mean return, DERIVATIVES_t represents the level of derivatives trading activity at time t, MOBILE_TRADING_t captures mobile trading activity, and ε_t is the error term with time-varying variance.

The variance equation (Equation 3.2) models volatility dynamics:

$$h_t = \omega + \alpha \varepsilon^2_{t-1} + \beta h_{t-1} + \delta_1\ \text{DERIVATIVES}_t + \delta_2\ \text{MOBILE\_TRADING}_t \qquad (3.6)$$

Here, h_t is the conditional variance of returns at time t, $\omega > 0$ is the constant term, $\alpha > 0$ captures the ARCH effect (the impact of past squared shocks on current volatility), $\beta > 0$ captures the GARCH effect (persistence of past volatility), while δ_1 and δ_2 measure the impact of derivatives trading and mobile trading on volatility, respectively.

8. RESULTS AND DISCUSSIONS

The first specific objective examined the effect of derivatives trading on stock market volatility. Using the GARCH (1,1) model, derivatives trading was included as an explanatory variable in the variance equation.

Table 1: Derivatives Trading and Stock Market Volatility

Parameter	NSE 20	NSE 25
δ_1 (Derivatives)	0.042*	0.037*
α (ARCH)	0.12	0.11
β (GARCH)	0.81	0.84

**Significant at 5% level*

The results in Table 1 demonstrate that derivatives trading creates a measurable increase in stock market volatility which affects both the NSE 20 and NSE 25 stock market indices. The estimated coefficients for derivatives activity (δ_1) show that the NSE 20 index value 0.042 ($t = 2.31$) and the NSE 25 index value 0.037 ($t = 2.18$) both reached 5% statistical significance. Derivatives trading volume rises because of increasing derivatives trading which produces greater conditional volatility because derivatives create more market volatility.

The ARCH (α) and GARCH (β) coefficients show statistical significance at the 5% level which proves that both indices exhibit volatility clustering behaviour. The α coefficients (0.12 for NSE 20 and 0.11 for NSE 25) indicate that recent market shocks have a measurable impact on current volatility, while the high β coefficients (0.81 and 0.84, respectively) demonstrate strong persistence in volatility, meaning that past volatility continues to influence current market conditions over time. The sum of α and β exists almost at one value because NSE 20 shows 0.93 and NSE 25 shows 0.95 which reveals market volatility stays active for a lengthy period. Market shocks to the system take a long time to vanish because extended periods exhibit high market volatility.

The second specific objective analyzed the effect of mobile trading platforms on stock market volatility.

Table 2: Mobile Trading Platforms and Stock Market Volatility

Parameter	NSE 20	NSE 25
δ_2 (Mobile Trading)	0.035*	0.048*
α (ARCH)	0.12	0.11
β (GARCH)	0.81	0.84

**Significant at 5% level*

According to Table 2 results mobile trading platforms produce positive effects on stock market volatility which shows statistical significance for both NSE 20 and NSE 25 stock indexes. The mobile trading activity coefficients (δ_2) show two results which include 0.035 (t = 2.14) for the NSE 20 index and 0.048 (t = 2.52) for the NSE 25 index which both reach significance at the 5% level. Increased usage of mobile trading platforms leads to greater market conditional volatility according to this finding. The research shows that mobile trading enables customers to access markets with high speed which motivates them to trade more frequently.

The ARCH (α) and GARCH (β) parameters show statistical significance which proves that both indices exhibit volatility clustering behaviour. The α coefficients (0.12 for NSE 20 and 0.11 for NSE 25) show that current volatility receives major influence from past shocks while the β coefficients (0.81 and 0.84 respectively) demonstrate strong ability to maintain volatile conditions across time. The alpha and beta values together approach one because they reach 0.93 for NSE 20 and 0.95 for NSE 25 which shows that the market experiences high volatility persistence. The mobile trading activity shocks maintain their effects for an extended period while the market experiences periods of high and low volatility which last until the market returns to its average state.

The variance equation in the GARCH (1,1) model allows simultaneous examination of derivatives and mobile trading effects. Results indicate that both innovations significantly contribute to volatility:

Table 3: Combined Effect of Derivatives and Mobile Trading on Volatility

Variable	**NSE 20**	**NSE 25**
Derivatives (δ_1)	0.042*	0.037*
Mobile Trading (δ_2)	0.035*	0.048*
ARCH (α)	0.12	0.11
GARCH (β)	0.81	0.84

The results from Table 3 demonstrate that both derivatives trading and mobile trading platforms

produce a statistically significant positive impact on stock market volatility which affects the NSE 20 and NSE 25 indices. The coefficients for derivatives (δ_1) are 0.042 (t = 2.31) and 0.037 (t = 2.18), while those for mobile trading (δ_2) are 0.035 (t = 2.14) and 0.048 (t = 2.52) for the NSE 20 and NSE 25 indices, respectively, all significant at the 5% level. The study results confirmed earlier findings from Objectives One and Two which showed that each innovation increased conditional volatility as an independent factor. The combined model therefore reinforces the conclusion that derivatives trading and mobile trading platforms jointly contribute to heightened market fluctuations. The NSE 25 index demonstrates greater sensitivity to mobile trading because its coefficient shows higher value which means that expanded retail investor market participation will create more significant market effects.

The ARCH (α) coefficients show statistical significance which demonstrates that previous shocks create substantial effects on present volatility, while the GARCH (β) coefficients (0.81 for NSE 20 and 0.84 for NSE 25) show that volatility maintains strong persistence. The sum of α and β is close to one (0.93 and 0.95, respectively), which indicates that volatility persists in high levels because shocks from increased trading activity will take extended periods to fade away. The findings support the results from individual models which were tested under Objectives One and Two, thus proving that the analysis results maintain their integrity.

9. CONCLUSIONS

The research demonstrated that derivatives trading creates a measurable positive effect on stock market volatility at the Nairobi Securities Exchange. The study found that increased derivatives trading activity leads to greater price changes which occur because traders engage in both speculative and hedging practices. The research demonstrated that mobile trading platforms create a major impact on stock market fluctuations. The market participation of retail investors has increased because mobile trading provides them with easy access and convenient trading options which results in more trading activity and short-term price changes. The study found that derivatives trading and mobile trading together create a combined effect which results in greater market volatility. The study results showed that market volatility shows strong persistence because market shocks continue to affect the market for an extended time.

The study concludes that financial innovations significantly impact stock market volatility in Kenya. Derivatives trading improves market efficiency which enables risk management yet it causes higher market volatility through speculative trading activities. Mobile trading platforms enable better market access because they allow more people to trade but their use has led to higher trading volumes which create temporary price changes. The research shows that stock market volatility has strong persistence because financial innovation shocks create effects which last for extended periods. The findings support Market Microstructure Theory which shows how trading systems and investor actions create market prices. Financial innovation creates new market possibilities which introduce new challenges that require organizations to find ways to achieve market growth while maintaining system stability.

10. RECOMMENDATIONS

The research study provides its recommendations based on the research findings which show how derivatives trading and mobile trading platforms affect stock market volatility in Kenya. The study results demonstrate that derivatives trading increases market volatility therefore the study recommends that market participants who use these financial instruments should implement better methods to control risks which will help them handle sudden price changes linked to these instruments.

The study findings demonstrate that mobile trading platforms have a major impact on market operations and short-term price fluctuations therefore the research study recommends that educational programs for investors need development which should specifically teach users of mobile platforms about informed trading methods which generate less market speculation.

The study recommends that the Nairobi Securities Exchange should establish a system to continuously assess financial innovations because these innovations impact market volatility patterns. The study recommends that financial innovation policies should match actual market behavior to create a framework which enables innovation while controlling its impact on market fluctuations.

Future studies should broaden their analysis by studying how financial innovations impact specific NSE sector indices because different sectors react differently to technological and financial advancements. The integration of high-frequency data which includes daily and intraday observations will result in more precise and complete market volatility estimates. Future research should investigate how emerging technologies such as algorithmic trading and digital assets reshape contemporary financial markets. The comparative analysis of different African stock markets will provide researchers with better understanding of regional patterns which will help them make broader discoveries.

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