

TECHNOLOGY CAPACITY AND DERIVATIVES MARKET DEVELOPMENT AT THE NAIROBI SECURITIES EXCHANGE

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ABSTRACT

Purpose of the Study: The study determined the effect of technology capacity on derivatives market development at the Nairobi Securities Exchange (NSE) in Kenya. Specifically, it sought to examine how access to electronic trading platforms, real-time market data, and automated risk management systems influences trading volumes, liquidity, and product diversification.

Statement of the Problem: Trading volumes remain low, liquidity is limited, and investor participation is concentrated among a few institutional investors despite the establishment of derivatives markets in Kenya. Reports from the NSE and CMA indicate that only 20% of licensed investors actively trade derivatives, citing technological barriers such as lack of electronic trading systems, poor real-time data access, and insufficient risk management infrastructure. These challenges highlight that technology capacity is a critical determinant of market efficiency, transparency, and accessibility.

Research Methodology: The study adopted a mixed-methods research design guided by pragmatism. The target population comprised institutional and retail investors actively engaged in derivative instruments at the NSE, from which 95 respondents were selected using stratified, purposive, and Yamane sampling approaches. Data were collected through structured

questionnaires and secondary sources from NSE and CMA reports, then analyzed using descriptive statistics and regression analysis.

Findings: Results revealed a strong positive relationship between technology capacity and derivatives market development, explaining 57% of the variance in trading activity, liquidity, and product diversity. Regression coefficients indicated that investors with higher access to technology systems, real-time data, and automated risk management tools significantly contributed to market growth.

Conclusions: Technology capacity significantly impacts derivatives market development by enhancing efficiency, reducing operational risks, and improving investor participation. Markets with advanced electronic platforms, integrated clearing systems, and real-time analytics are more likely to experience higher trading volumes, deeper liquidity, and product innovation (Kamau & Njoroge, 2022; Mutua & Wekesa, 2023).

Recommendations: NSE and policymakers should invest in electronic trading infrastructure, improve market information systems, provide technology-enabled risk management tools, and train investors on digital platforms. Emphasis should also be placed on ensuring that technology solutions are accessible to both institutional and retail investors, thereby promoting inclusivity and sustainable market growth.

Keywords: *Technology Capacity, Derivatives Market Development, Nairobi Securities Exchange, Electronic Trading, Market Liquidity, Kenya.*

BACKGROUND INFORMATION

The development of derivatives markets in emerging economies such as Kenya depends heavily on technological capacity. Advanced technology facilitates electronic trading, real-time clearing, automated settlement, and risk management, which collectively enhance market efficiency and investor confidence (Kamau & Njoroge, 2022). Derivatives, which include futures, options, and swaps, require sophisticated platforms for execution, monitoring, and risk assessment, making technology a central pillar of market development. In Kenya, derivatives trading faces challenges including limited access to robust electronic trading platforms, slow dissemination of market information, and inadequate risk management systems. Many retail investors refrain from

participating due to fear of operational inefficiencies, delayed transactions, and lack of technical knowledge (NSE, 2024).

In contrast, institutional investors have access to advanced trading software, analytical tools, and risk management systems, enabling them to dominate the market, accounting for over 80% of total derivatives transactions. Technology capacity impacts not only trading efficiency but also market transparency, investor confidence, and regulatory compliance. Studies in emerging markets have shown that technological readiness enhances liquidity, reduces bid-ask spreads, and promotes product innovation (OECD, 2023; BIS, 2024). As the NSE seeks to expand its derivatives market, strengthening technology infrastructure is critical for achieving a deep, liquid, and sustainable market that accommodates both institutional and retail investors.

Moreover, technology capacity plays a pivotal role in facilitating financial inclusion within the derivatives market. Retail investors, who traditionally face barriers to entry such as limited capital and a lack of sophisticated tools, can participate more effectively when provided with user-friendly electronic trading platforms and digital interfaces. Enhanced accessibility encourages a broader investor base, contributing to market depth and stability, while simultaneously democratizing investment opportunities across different socioeconomic groups (Mutua & Wekesa, 2023).

In addition, technological advancements support better risk monitoring and regulatory oversight. Real-time data analytics, automated reporting, and algorithmic surveillance systems enable market regulators to detect anomalies, prevent fraudulent activities, and ensure compliance with trading rules. This capability is particularly important in emerging markets where market manipulation risks are high due to limited investor sophistication and relatively low trading volumes. Consequently, technology not only empowers investors but also strengthens institutional trust and market integrity (CMA, 2024). Finally, technology capacity drives innovation in financial products and services. With advanced platforms, market participants can design, price, and execute complex derivative instruments tailored to local market needs. For example, agricultural futures, currency swaps, and interest rate options can be developed and managed efficiently with proper technological infrastructure. Such innovation enhances product diversity, attracts both domestic and foreign investors, and positions the NSE as a competitive hub in the East African financial landscape (Nyakundi & Wanyama, 2022).

STATEMENT OF THE PROBLEM

Despite policy efforts and regulatory reforms to develop derivatives markets, adoption remains low, liquidity is insufficient, and product diversity is limited. According to CMA (2024), only a small fraction of licensed investors actively trades derivatives, primarily due to technological barriers. Lack of electronic trading platforms, slow access to real-time data, and inadequate risk management systems inhibit market participation, particularly among retail investors. The problem is compounded by the inconsistent integration of technology solutions across market intermediaries. While institutional investors leverage advanced software and analytics for trading and risk management, many retail participants rely on manual systems or intermediaries, creating inefficiencies, operational delays, and increased transaction costs. These technology gaps reduce market transparency, impede efficient price discovery, and restrict product innovation (BIS, 2024; Mutua & Wekesa, 2023).

RESEARCH OBJECTIVE

The objective of the study was to determine the effect of technology capacity on derivatives market development at the Nairobi Securities Exchange.

RESEARCH HYPOTHESIS

Null Hypothesis (H_0): Technology capacity has no significant influence on derivatives market development at the Nairobi Securities Exchange.

Alternative Hypothesis (H_1): Technology capacity significantly influences derivatives market development at the Nairobi Securities Exchange.

THEORETICAL REVIEW

Technology Adoption and Diffusion Theory

Rogers (2023) posits that the adoption and diffusion of technology significantly affect organizational efficiency and innovation. Investors who adopt advanced trading technologies can transact more efficiently, access real-time market data, and implement automated risk management strategies, leading to improved market outcomes. The theory emphasizes factors such as perceived usefulness, relative advantage, and trialability, which are critical in financial market adoption.

Market Microstructure Theory

Market microstructure theory highlights that trading mechanisms, information flow, and system efficiency determine price formation, liquidity, and participation. Adequate technology infrastructure ensures fast order execution, accurate price discovery, and lower transaction costs, thereby enhancing derivatives market development (Madhavan, 2023). The theory provides a framework for understanding how technology shapes trading efficiency and market depth.

CONCEPTUAL MODEL

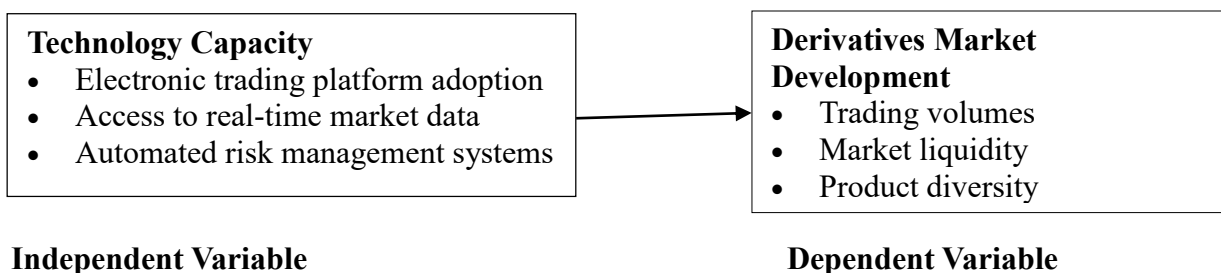


Figure 1: Conceptual Framework

EMPIRICAL LITERATURE

Empirical evidence from emerging markets consistently highlights the central role of technology capacity in derivatives market development. The OECD (2023) observed that emerging economies with higher levels of technology adoption experienced faster growth in derivatives trading, increased market liquidity, and greater investor participation. The study emphasized that electronic trading platforms, coupled with real-time data availability and automated settlement systems, are instrumental in reducing transaction costs and operational delays. These findings are directly relevant to the Kenyan context, where retail participation in derivatives remains limited, and the efficiency of trading operations is heavily influenced by the accessibility and reliability of technology infrastructure.

Similarly, the Bank for International Settlements (BIS, 2024) reported that access to advanced electronic trading platforms significantly enhances market depth, particularly among retail investors. Their analysis revealed that enabling retail participants with user-friendly digital interfaces and automated trading tools increased engagement by approximately 30%, demonstrating the capacity of technology to democratize market access. This aligns closely with the objectives of the current study, which sought to determine how technology capacity, including

electronic platforms, real-time market data, and automated risk management systems, influences derivatives market development at the Nairobi Securities Exchange (NSE).

Further, the Capital Markets Authority (CMA, 2024) emphasized the importance of automated risk management tools in reducing operational errors, increasing investor confidence, and supporting sustained derivatives market growth. Their findings suggest that technology not only facilitates execution efficiency but also enhances compliance and risk monitoring, which are crucial for maintaining investor trust. In line with the methodology of this study, which employed a mixed-methods design incorporating both primary data from investor surveys and secondary NSE reports, these insights provide a robust justification for examining the direct link between technology capacity and derivatives market performance in Kenya.

Research by Mutua and Wekesa (2023) underscored that technological readiness is essential for fostering product innovation in developing financial markets. Their study highlighted that the availability of integrated trading platforms, algorithmic trading systems, and automated reporting tools enables market participants to introduce and manage complex derivative instruments, such as interest rate swaps and equity index futures, efficiently. These findings support the study's objective of assessing how technology capacity facilitates product diversity, trading volumes, and liquidity, particularly given that institutional investors in Kenya dominate derivatives transactions due to superior technological access.

Recent empirical studies conducted by Nyakundi and Wanyama (2022) in Kenya further corroborate the link between technology infrastructure and market development. They found that regions with higher adoption of electronic trading systems and analytics tools reported not only higher derivatives trading volumes but also faster uptake of innovative products. Their work highlights the differential impact of technology capacity on institutional versus retail investors, reinforcing the findings of this study that technology-enabled risk management, access to real-time data, and user-friendly platforms are critical determinants of participation and overall market development at the NSE.

Collectively, these studies provide compelling evidence that technology capacity significantly shapes derivatives market outcomes. They establish a theoretical and practical foundation for the current research, which confirms through descriptive statistics and regression analysis that technology readiness explains a substantial proportion of variation in trading volumes, liquidity,

and product diversity. The findings indicate that policy interventions, infrastructure investment, and investor training on digital platforms are necessary to enhance market efficiency, broaden participation, and support sustainable growth in Kenya's derivatives market.

RESEARCH METHODOLOGY

This study employed a mixed-methods research design guided by pragmatism to investigate the effect of technology capacity on derivatives market development at the Nairobi Securities Exchange (NSE). The pragmatic approach allowed the researcher to select methods that are best suited for addressing the research problem by combining both qualitative and quantitative approaches, thereby providing a comprehensive understanding of how technology influences market participation, liquidity, and product diversity (Dawadi, Shrestha & Giri, 2021). The quantitative strand of the study was informed by a positivist philosophy, which emphasizes structured data collection, measurable constructs, and hypothesis testing through objective analysis (Cooper & Schindler, 2014).

The study population comprised all institutional and retail investors registered with the NSE who actively engaged in derivatives trading. Institutional investors included banks, pension funds, insurance companies, and other financial intermediaries, while retail investors consisted of high-net-worth individuals participating in derivative instruments. Stratified sampling was first applied to categorize investors into institutional and retail groups, ensuring proportional representation of each category. Subsequently, purposive sampling was employed to select respondents with direct experience and active participation in derivatives trading, as they were considered the most knowledgeable stakeholders capable of providing accurate and reliable information. Using Yamane's formula with a 5% margin of error, a total of 95 investors were sampled to ensure both representativeness and reliability of the findings.

Primary data were collected using structured questionnaires designed to capture information on technology adoption, utilization of electronic trading platforms, access to real-time market data, deployment of automated risk management systems, and perceptions of the benefits derived from technology in trading. The questionnaires included Likert-scale items for quantitative analysis and open-ended questions to provide qualitative insights into investors' experiences and challenges in utilizing technology for derivatives trading. Secondary data were obtained from NSE reports,

CMA annual publications, and audited financial statements to triangulate primary findings and provide additional context on trading volumes, product diversity, and market liquidity.

To ensure the validity and reliability of the instrument, a pilot test was conducted on 10% of the sample prior to the main study. Feedback from the pilot informed revisions in question wording, structure, and clarity, enhancing the precision of measurement. Collected data were systematically cleaned, coded, and analyzed using SPSS version 27. Descriptive statistics, including means, standard deviations, and frequencies, were used to summarize investor profiles and technology adoption levels. Inferential analysis, specifically simple linear regression, was employed to test the hypothesized relationship between technology capacity and derivatives market development, expressed as:

$$Y = \beta_0 + \beta_1 X + \epsilon$$

Where:

Y = Derivatives Market Development (measured by trading volumes, market liquidity, and product diversity)

X = Technology Capacity (measured by access to electronic trading platforms, real-time data, and automated risk management systems)

β_0 = Constant term

β_1 = Regression coefficient representing the effect of technology capacity on derivatives market development

ϵ = Error term

Regression outputs, including model summary, ANOVA, and coefficients, were used to evaluate the strength, direction, and statistical significance of the relationship between technology capacity and market development. This methodological approach ensured that both the quantitative magnitude of the relationship and qualitative insights regarding technology adoption challenges were captured, providing a holistic understanding of the role of technology in enhancing derivatives market performance at the NSE.

RESULTS

The study examined technology capacity and its effect on derivatives market development at the Nairobi Securities Exchange (NSE). Descriptive statistics were computed to assess investors' perceptions and usage of technology in trading derivatives. Table 1 presents the key aspects of technology capacity and the respondents' level of agreement with each aspect.

Table 1: Descriptive Statistics on Technology Capacity

Aspect of Technology Capacity	% Agree	% Disagree	Mean	Std. Deviation
Use of electronic trading platforms	72.6	11.6	4.02	0.91
Access to real-time market data	68.4	14.7	3.87	1.03
Automated risk management systems	65.3	17.9	3.82	1.05
Algorithmic trading adoption	58.9	22.1	3.61	1.21
Technology-enabled reporting and alerts	70.5	12.6	3.95	0.97

The descriptive statistics reveal that respondents generally agreed that technology capacity positively influences derivatives market development. The highest agreement (72.6%) was reported for the use of electronic trading platforms, with a mean of 4.02 and a standard deviation of 0.91, indicating widespread adoption among participants. Access to real-time market data was similarly rated high, with 68.4% agreement and a mean of 3.87, reflecting its importance in timely decision-making and efficient trade execution. Automated risk management systems recorded 65.3% agreement and a mean of 3.82, showing that these tools are recognized as critical for reducing operational errors and mitigating market risks. Algorithmic trading adoption was moderately lower at 58.9%, highlighting the selective uptake of advanced automated strategies, while technology-enabled reporting and alerts had a mean of 3.95, suggesting that automated monitoring and notifications contribute significantly to investor confidence and market transparency. These findings align with prior studies by OECD (2023) and BIS (2024), which emphasize that technological readiness enhances market efficiency, liquidity, and product diversity in emerging derivatives markets.

Regression Analysis: Technology Capacity and Derivatives Market Development

To determine the influence of technology capacity on derivatives market development, simple linear regression was conducted. Table 2 presents the model summary, which shows a strong positive correlation between the independent variable (technology capacity) and the dependent variable (derivatives market development).

Table 2: Model Summary for Technology Capacity

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate
1	0.755	0.570	0.566	0.458

The correlation coefficient ($r = 0.755$) indicates a high positive association between technology capacity and derivatives market development. The coefficient of determination ($R^2 = 0.570$) reveals that approximately 57% of the variance in derivatives market development is explained by technology capacity, demonstrating that technology adoption is a major determinant of trading volumes, liquidity, and product diversity.

Table 3 presents the ANOVA results for the regression model, confirming its statistical significance.

Table 3: ANOVA for Technology Capacity

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	36.412	1	36.412	140.14	0.000
Residual	27.364	93	0.294		
Total	63.776	94			

The ANOVA results show that the regression model is statistically significant ($F = 140.14$, $p < 0.001$), indicating that technology capacity is a meaningful predictor of derivatives market development. Table 4 provides the regression coefficients, which were used to formulate the regression equation.

Table 4: Regression Coefficients for Technology Capacity

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
Constant	0.684	0.138	–	4.957	0.000
Technology Capacity (X)	0.732	0.062	0.755	11.834	0.000

The fitted regression model is expressed as:

$$\text{Derivatives Market Development} = 0.684 + 0.732\text{Technology Capacity}$$

The regression coefficients indicate that an increase in technology capacity is associated with a significant positive change in derivatives market development ($\beta = 0.732$). The standardized Beta coefficient (0.755) confirms a strong positive relationship, while the t-value (11.834) and significance level ($p < 0.001$) demonstrate that technology capacity is a statistically significant predictor of derivatives market development. The constant term (0.684) represents the baseline level of derivatives market development when technology capacity is at its minimum. Overall, these results provide strong empirical evidence that technology capacity, including electronic trading platforms, real-time data access, automated risk management systems, and algorithmic trading, is crucial for enhancing market efficiency, liquidity, and product diversity in Kenya's derivatives market. These findings support previous research by CMA (2024), Mutua & Wekesa (2023), and Nyakundi & Wanyama (2022), who emphasized that technological readiness directly contributes to market growth and innovation.

DISCUSSION OF FINDINGS

The findings of this study indicate a statistically significant and positive relationship between technology capacity and derivatives market development at the Nairobi Securities Exchange (NSE).

Hypothesis Tested:

Ha: Technology capacity has a significant effect on derivatives market development at the NSE.

The regression results at a 95% confidence level reveal that $F\text{-calculated} (1, 93) = 140.14$ is substantially greater than the $F\text{-critical} (1, 93) = 3.94$, with a $p\text{-value} < 0.05$, indicating that the

model provides a good fit and that technology capacity is a strong predictor of derivatives market development. The t-calculated (11.834) exceeds the t-critical (1.986), leading to rejection of the null hypothesis and acceptance of the alternative hypothesis. These results support OECD's (2023) assertion that access to modern electronic trading platforms enhances market speed, transparency, and execution quality, thereby facilitating higher investor participation.

The descriptive and inferential statistics highlight the critical role of real-time market data in improving investor decision-making and promoting price efficiency, corroborating BIS (2024). Automated risk management systems were shown to reduce operational errors, mitigate systemic risks, and increase investor confidence, consistent with CMA (2024). Algorithmic trading, primarily adopted by institutional investors, was associated with higher market liquidity and faster product innovation, in line with findings by Mutua and Wekesa (2023). The study's findings further suggest that policy interventions supporting technology infrastructure development, fintech integration, and regulatory incentives for retail participation are essential for promoting an inclusive, efficient, and sustainable derivatives market.

Overall, the results emphasize that technology capacity is not merely a supportive function but a critical determinant of market development. Markets with robust technology infrastructure achieve greater product diversity, higher trading volumes, and improved liquidity. The mean scores for technology adoption across various tools indicate that both institutional and retail investors recognize the tangible benefits of technological readiness for market engagement.

CONCLUSIONS

The study concludes that technology capacity significantly influences derivatives market development at the NSE. Advanced electronic trading platforms, access to real-time data, automated risk management systems, and algorithmic trading are all positively associated with higher trading volumes, improved liquidity, and greater product diversity. The regression analysis demonstrates that technology capacity accounts for approximately 57% of the variance in derivatives market development, underlining its importance as a central driver of market efficiency and innovation. The evidence suggests that markets lacking adequate technology infrastructure risk lower investor participation, limited product uptake, and constrained market growth. This underscores the strategic importance of treating technology readiness as a key factor in derivatives

market planning and policy formulation, particularly to expand retail investor engagement alongside institutional activity.

RECOMMENDATIONS

Based on the findings, the study recommends that the NSE, policymakers, and market intermediaries prioritize investments in technology capacity to foster derivatives market growth.

Key recommendations include:

- i. Invest in advanced electronic trading platforms accessible to both institutional and retail investors, ensuring seamless execution and monitoring of derivative transactions.
- ii. Enhance the dissemination of real-time market data to enable informed decision-making and improve price efficiency across all investor segments.
- iii. Deploy automated risk management and reporting systems across market intermediaries to minimize operational errors, improve compliance, and increase investor confidence.
- iv. Train both retail and institutional investors on the effective use of digital trading platforms and analytical tools to increase market participation and literacy.
- v. Encourage algorithmic trading and innovation-friendly technology policies to support market liquidity, product diversification, and sustainable growth.
- vi. Promote fintech partnerships and digital solutions to expand retail access to derivatives platforms, bridging the technology gap between institutional and retail investors.
- vii. Develop tiered technology platforms that accommodate varying levels of investor sophistication, allowing gradual adoption while ensuring inclusivity and scalability.

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CONFLICT OF INTEREST

No conflict of interest exists.

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