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# Trade Automation, Transaction Costs and Performance of Securities Markets in East African Community, Within Member States

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## Abstract

Despite the adoption of trade automation to enhance trading processes, the performance of securities markets globally remains suboptimal, with market participants reporting declining market capitalization and increased volatility. These challenges are aggravated by fragmented market structures, where each market include East Africa Community (EAC) markets operate with unique inefficiencies, such as limited access to real-time information and deviations from the efficient market hypothesis. High transaction costs, such as brokerage and settlement fees, further deter trading activity, eroding potential gains from automation. While trade automation is expected to streamline operations and improve price discovery, its implementation in the EAC has produced mixed results, with some studies suggesting it exacerbates market instability. The interplay between trade automation and transaction costs remains inadequately understood, particularly in emerging markets like the EAC. In particular, the research aimed to establish the effect of transaction costs on the relationship between trade automation and performance of securities markets in EAC. Utilizing a descriptive cross-sectional research design, secondary data were collected from the four established securities exchanges in the EAC for the period 2015 to 2024. The analysis employed regression techniques using Stata software to evaluate the relationships among the variables. The results indicated that transaction costs, particularly clearing and settlement fees, significantly moderate the relationship between trade automation and market performance of securities in EAC. Thus, policymakers and regulators should focus on reducing brokerage fees, which have a significant negative impact on market performance, by implementing streamlined processes and cost-effective policies. Additionally, clearing and settlement fees should be optimized while efforts to enhance performance through improved trading systems and better dissemination of market information are crucial, as efficiency positively influences market outcomes.

**Keywords:** Trade Automation, Transaction Costs, Performance, Market Securities, East African Community

## 1.1 Introduction

Trade automation refers to the application of computer-driven systems to execute trading instructions in financial markets, based on pre-programmed parameters such as timing, price, and volume. As defined by Dimov (2022), trade automation encompasses the digital infrastructure and algorithmic logic that support electronic trading, thereby reducing human intervention and enabling high-frequency trading. Bouchaud and Potters (2022) extend this definition by viewing trade automation as the transition from discretionary trading to data-driven execution supported by real-time analytics and low-latency platforms. Similarly, Abdullahi and Peters (2023) define trade automation as the deployment of automated trading systems to execute buy and sell orders across multiple trading venues with minimal human input. Drawing from these perspectives, this study defines trade automation as the use of electronic and algorithmic systems to facilitate the execution of financial transactions with improved speed, reduced costs, and enhanced accuracy, measured by average total market capitalization and securities trade volumes on a given exchange.

On the other hand, transaction costs refer to the direct and indirect expenses incurred in the process of executing financial trades. According to Aspris *et al.* (2025), they include brokerage commissions, bid-ask spreads, clearing and settlement fees, exchange levies, and custodial charges, all of which affect the net returns realized by investors. In modern financial systems, transaction costs are recognized as a central determinant of market behavior, influencing investor participation, trade frequency, and portfolio strategies. As noted by Bozic and Bozic (2025), these costs can either facilitate or impede efficient capital flows, depending on how effectively they are managed and minimized. The structural design of trading platforms and the regulatory environment also determine the magnitude and distribution of these costs across different classes of investors.

The interplay between trade automation, transaction costs, and securities market performance has gained growing attention in recent financial literature, especially in the context of emerging and frontier markets. Trade automation is widely recognized as a mechanism for improving operational efficiency, facilitating real-time price discovery, and enhancing market liquidity. According to Oyeniyi, Ugochukwu, and Mhlongo (2024), algorithmic trading has significantly reduced latency and bid-ask spreads, improving execution quality in both developed and developing economies. Similarly, Herman and Oliver (2023) found that digital trade rules and automation have had a statistically significant effect on trade costs and efficiency, especially in low- and middle-income countries. However, while automation contributes to price accuracy and market dynamism, its influence on volatility and systemic risk remains contested.

Empirical literature has emphasized that trade automation enhances execution speed and minimizes human error. Mugo and Kiragu (2024) found that electronic trading systems in Kenya and Rwanda improved transparency and investor confidence, while Mutua and Kaburu (2024) highlighted the influence of technological integration on liquidity and market depth. Yet, structural and regulatory bottlenecks persist in the EAC. Despite the automation of clearing and settlement systems, challenges such as information asymmetry, inconsistent investor protections, and varying levels of technological adoption continue to hinder integration and efficiency (Chacha & Gekara, 2023; Mugambi & Sudi, 2024). Moreover, variations in transaction costs such as brokerage fees, clearing charges, and exchange levies contribute to unequal market participation and suboptimal price discovery, issues that are particularly acute in thinly traded markets like the Uganda Securities Exchange (USE).

Within this evolving regional context, the Nairobi Securities Exchange (NSE) has implemented several technological innovations, including the Automated Trading System (ATS) and the Broker Back Office system. While these tools have improved market operations, their impact has not been uniform across the region. Bukenya and Odhiambo (2024) assert that Rwanda's RSE and Tanzania's DSE have made strides in automation, but they still face challenges in attracting liquidity and achieving scale. Furthermore, the implementation of the East African Capital Markets Infrastructure Project (EACMIP) seeks to integrate trading platforms and harmonize regulatory regimes across member states. However, evidence on the effectiveness of such integration remains limited and warrants empirical investigation. This study, therefore, seeks to assess how trade automation, and transaction costs influence the performance of securities markets in the EAC.

The performance of securities markets is a multifaceted concept that reflects the ability of financial markets to facilitate capital formation, liquidity provision, and efficient pricing of securities. A well-performing securities market enables investors to buy and sell financial assets with minimal friction, fostering both investor confidence and economic stability. In evaluating market performance, key indicators include trading volume, stock market index returns, and market capitalization. According to Kumar and Sinha (2023), trading volume is an essential metric because it reflects the level of investor participation and market activity, which are critical for ensuring liquidity and efficient price discovery.

Empirical studies focusing on emerging markets, including those in the East African Community, underscore the importance of contextual factors such as regulatory integration, technological infrastructure, and macroeconomic stability in shaping market performance. For instance, Brogaard et al. (2020) note that while automation has enhanced liquidity and price discovery in developed exchanges, its effects in emerging contexts depend heavily on institutional maturity and cross-border harmonization. Evaluating securities market performance in the EAC thus necessitates both quantitative metrics such as trading volume and market capitalization and qualitative assessments of regulatory coherence and investor confidence.

Securities markets in the East African Community have evolved significantly since the establishment of the Nairobi Securities Exchange (NSE) in 1954 under the former British Protectorate of East Africa. Initially serving companies in Kenya, Uganda, and Tanzania, the NSE functioned as a regional trading platform. However, the collapse of the EAC in 1977 led to the nationalization and delisting of foreign firms in Uganda and Tanzania, causing the NSE to operate solely as a Kenyan institution (Moh'd, 2021; Matanda & Karugia, 2023). The 1990s witnessed the re-emergence of national stock exchanges, with Tanzania launching the Dar es Salaam Stock Exchange (DSE) and Uganda establishing the Uganda Securities Exchange (USE). Rwanda, a later entrant to the EAC, initiated the Rwanda Stock Exchange (RSE) in 2011 to facilitate capital mobilization and attract foreign direct investment (Basu & Michayluk, 2022; Bukenya & Odhiambo, 2024).

Today, the EAC is served by four primary stock exchanges: Kenya's NSE, Tanzania's DSE, Uganda's USE, and Rwanda's RSE. According to Makau, Njeru, and Musyoka (2021) these exchanges vary in market size and level of technological sophistication. As of 2020, the total market capitalization of the four exchanges reached approximately USD 42 billion, with the NSE accounting for more than half of the total (Wambugu & Githinji, 2022). This dominance has reinforced Kenya's position as the financial hub of the region. Despite this growth, disparities persist across EAC markets in terms of investor participation, technological adoption, liquidity levels, and regulatory structures (Bwakira & Mwangi, 2023). These

differences pose a challenge to the full realization of integrated capital markets across the bloc and present concerns for performance and efficiency.

Efforts to harmonize securities markets within the EAC are ongoing, spearheaded by initiatives such as the East African Securities Regulatory Authorities (EASRA). This platform aims to foster collaboration among national regulators, standardize trading practices, and enhance cross-border investments (Ndung'u & Mugambi, 2024). One of the key interventions under this framework is the promotion of trade automation, which includes the deployment of electronic trading systems and automated clearing and settlement platforms. Automation has led to improvements in market transparency, execution speed, and cost efficiency (Akech & Otieno, 2023). However, challenges such as high transaction costs, low internet penetration in some areas, and uneven technological capabilities remain significant barriers to efficiency and market integration.

In addition to capital market-specific interventions, the broader EAC integration strategy has seen the implementation of the Single Customs Territory (SCT) to streamline intra-regional trade. While the SCT and customs automation efforts have reduced some procedural bottlenecks, non-tariff barriers (NTBs) still hamper trade flows across member states (UNECA, 2024). These include bureaucratic delays, inconsistent quality standards, and varying regulatory frameworks. Moreover, despite the introduction of tools like the EAC Trade Information Portal and the NTB Reporting System, information asymmetry and limited capacity among small-scale traders continue to limit the impact of these reforms (Nanyanzi & Rurangwa, 2024).

## 1.2 Research Problem

The adoption of automated trading technologies ranging from electronic order-matching systems to high-frequency trading algorithms has transformed financial markets globally, with the expectation of reducing latency, improving price discovery, and boosting liquidity. Yet, the applicability of foundational theories such as market microstructure and transaction cost economics in emerging economies like those in the East African Community remains contested. These theories assume stable, liquid, and transparent trading environments (Kang, Lee, & Park, 2022) conditions rarely met in the region's nascent capital markets (Ndegwa & Mwangi, 2022). Despite automation's theoretical potential, the realities of low institutional capacity, fragmented regulation, and infrastructure disparities across the EAC suggest that these benefits may not be fully realized.

Empirical studies have produced mixed findings on the impact of trade automation. In developed economies, research has consistently shown that algorithmic trading enhances liquidity and reduces transaction costs (Brogaard et al., 2020). However, in emerging markets, results are far from conclusive. Owade (2023) observed that automation improved trading volumes and market access at the Nairobi Securities Exchange, while Nalwenge and Jagongo (2021) reported no significant performance improvements at the Uganda Securities Exchange, attributing this to weak infrastructure and limited investor participation. The effect of automation is thus highly context-dependent, influenced by underlying market maturity and regulatory readiness.

The influence of transaction costs further complicates the automation-performance nexus. While automation is assumed to lower transaction costs, findings vary significantly depending on the market and cost component examined. Studies from the U.S. and Europe confirm declines in brokerage and execution costs following automation (Degryse & Nguyen, 2020; Hasbrouck, 2022), yet EAC evidence suggests that exchange and clearing fees remain high, eroding potential efficiency gains (Makau, Onjala, & Muluvi, 2021; Amol, 2023). On the other

hand, a study by Menkveld (2021) found that automation introduces new implicit costs, such as information asymmetry and adverse selection, especially where regulatory oversight is weak.

In addition to these conceptual and empirical inconsistencies, methodological limitations remain. Many studies rely on cross-sectional data or single-year case studies, limiting the ability to observe evolving market behavior or disentangle causal effects. Few studies have adopted a holistic framework that accounts for the joint and interactive effects of automation and transaction costs (Hossain, 2022; Easley & O'Hara, 2022). This fragmented evidence base hampers the development of sound policy responses tailored to the EAC context. Hence, this study sought to address the following research question: How does trade automation, and transaction costs impact the East African Community's securities markets' performance?

## 2.1 Literature Review and Research Gaps

Transaction Cost Economics (TCE), originally introduced by Ronald Coase (1937) and further developed by Oliver Williamson (1985, 1996), provides a foundational theoretical lens for understanding the institutional and structural factors that influence transaction behaviors in financial markets. The theory posits that market actors operate under bounded rationality and opportunism, and will organize transactions in a way that minimizes associated costs such as those incurred through information search, contract negotiation, monitoring, and enforcement. In securities markets, particularly in emerging economies, these costs significantly affect market liquidity, efficiency, and investor behavior. Within the East African Community, TCE offers a useful framework for diagnosing the frictions that undermine market performance across disparate trading environments.

TCE assumes that markets are inherently imperfect and that institutional governance mechanisms must align with transaction characteristics like frequency, uncertainty, and asset specificity (Singireddy, Chigbo, & Matar, 2024). For instance, the Nairobi Securities Exchange has made notable progress in minimizing transaction costs through the adoption of straight-through processing systems and centralized depository platforms. These advancements have improved investor trust and transaction speed. Conversely, markets such as the Uganda Securities Exchange (USE) and the Dar es Salaam Stock Exchange (DSE) still grapple with operational inefficiencies arising from manual trade settlements, fragmented legal frameworks, and underdeveloped investor protection laws (Makau, Onjala, & Muluvi, 2021). These structural limitations elevate asset specificity and increase governance-related transaction costs, as institutional arrangements are less capable of enforcing contracts or managing cross-border trades efficiently.

TCE underscores that governance structures be they market-based, hybrid, or hierarchical should be tailored to match the risk and complexity of transactions. In the EAC, market harmonization remains a key challenge. Differences in tax regimes, legal interpretations of financial contracts, and inconsistent capital market regulations have increased the cost of cross-border investment. For example, an investor in Rwanda's RSE may face higher legal and compliance costs when seeking to trade equities listed on the NSE due to regulatory discrepancies. Williamson's concept of asset specificity becomes highly relevant here, as investments in one country may not be easily redeployable or recognized in another without substantial transaction frictions (Oladokun, 2023).

Moreover, automation technologies such as algorithmic trading, centralized clearing, and electronic depositories are increasingly being adopted as governance solutions to mitigate transaction inefficiencies. Kenya's NSE has led the region in deploying such tools, which have significantly reduced explicit transaction costs like brokerage commissions and clearing fees. However, similar systems in Tanzania and Uganda remain at nascent stages, and in Burundi

and South Sudan, such infrastructure is largely non-existent. This uneven technological adoption means that automation's benefits such as improved trade execution, reduced latency, and greater transparency are not uniformly realized across the EAC (Decker, 2023).

Importantly, transaction costs in EAC securities markets also include implicit elements such as slippage, liquidity constraints, and investor inertia. Ndegwa and Mwangi (2022) highlight that while automation in Kenya has decreased explicit trading fees, implicit costs remain elevated due to thin market depth and volatility, especially in less liquid exchanges like the USE. TCE thus encourages a multidimensional analysis that considers not just institutional readiness but also behavioral and infrastructural limitations that hinder transaction efficiency. The behavioral extension of TCE, as proposed by Oladokun (2023), is particularly useful in contexts like Rwanda and Uganda, where digital literacy gaps and trust deficits affect the willingness of investors to adopt automated platforms.

Applying TCE to the current study yields several implications. First, automation is effective in lowering transaction costs only when paired with synchronized institutional reforms. Second, governance misalignments evident in the legal, tax, and operational disparities among EAC member states continue to obstruct integration and efficiency. Third, EAC policymakers must address both technical and behavioral barriers to fully leverage automation's cost-reduction potential. Comparative assessments (such as analyzing bid-ask spreads, execution time, and settlement efficiency across the NSE, DSE, USE, and RSE) can help validate TCE's propositions. Ultimately, the theory provides a comprehensive base for crafting targeted interventions that promote liquidity, integration, and investor confidence in the region's evolving capital markets.

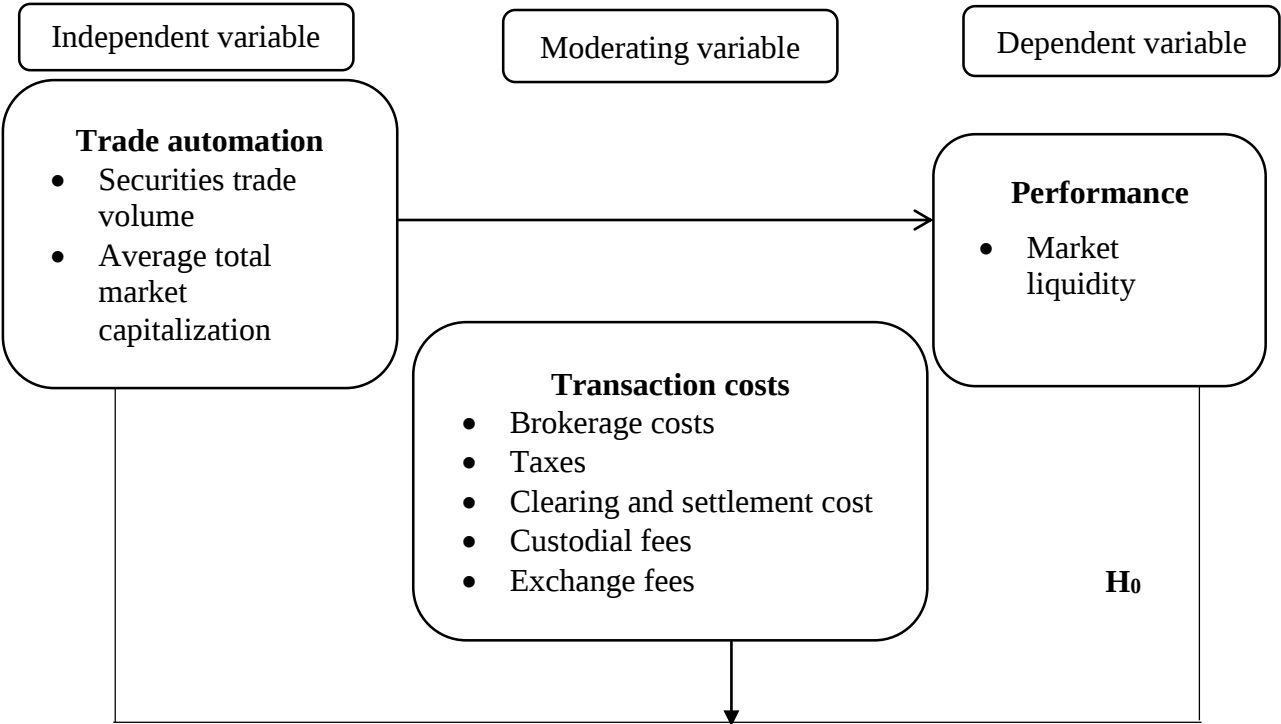
The existing literature offers a broad yet comprehensive understanding of the relationship between trade automation, transaction costs, and securities market performance. Several studies have affirmed that algorithmic and AI-driven trading systems play a transformative role in improving liquidity, narrowing bid-ask spreads, and enhancing execution speed. Addy et al. (2024) and Degryse and Nguyen (2020) demonstrated that automated systems can improve price discovery and reduce friction in trading, particularly when integrated with real-time data analytics. Empirical studies such as those by Dubey (2022) and Tremacoldi-Rossi (2022) reveal that trade automation often leads to improved trading outcomes by facilitating smaller trade sizes and reducing price impact. However, these benefits are not uniformly experienced across all markets. For instance, while algorithmic trading may perform well in developed economies with deep liquidity and strong regulatory oversight, its effects in emerging markets can be more volatile and uncertain. Courdent and McClelland (2022), in their analysis of the Johannesburg Stock Exchange, illustrated this dual effect by showing that although algorithmic trading enhanced liquidity, it also increased short-term volatility.

While the positive effects of automation on transaction costs and efficiency are well-documented, the literature also identifies significant gaps. Much of the existing evidence is based on studies conducted in mature financial systems, with limited empirical attention paid to developing economies like those in the East African Community. Even though automation technologies such as blockchain and smart contracts are touted as solutions for transparency and settlement efficiency, studies like those by Roeck, Sternberg, and Hofmann (2020), Shah and Allam (2020), and Qian and Dong (2025) are largely conceptual or theoretical and do not provide detailed empirical analyses of their impacts in under-resourced market settings.

Another critical limitation is the lack of research that holistically examines the interaction between trade automation, transaction costs and performance. Many studies tend to isolate these variables without addressing their interdependencies. For example, while Cao and Wei (2020)

confirmed the cost-reduction benefits of algorithmic trading, their work did not delve into how those cost reductions influenced market resilience or investor behavior over time. Similarly, van Kervel and Menkveld (2020) observed both positive and negative impacts of high-frequency trading around large institutional orders but did not investigate these outcomes in emerging markets with limited liquidity and weaker regulatory frameworks.

The literature also reveals a theoretical gap in applying frameworks such as transaction cost economics and institutional theory in the analysis of trade automation’s market-level implications. Studies like those by Cuypers et al. (2021) and Zhu, Bai, and Sarkis (2022) emphasize the importance of grounding automation research in robust theory, yet practical applications of these theories in the securities trading context remain sparse. This limitation is particularly pressing in contexts where regulatory capacity is evolving and where automation may amplify market fragmentation or systemic risk. The conceptual diagram in figure 1 below shows how the study variables relate to each other.



**Figure 1: Conceptual Framework**

**Source: Researcher (2025)**

The conceptual framework presented in this study illustrates the relationships among the key variables: trade automation, transaction costs, and the performance of securities markets within EAC member states. Trade automation is considered the independent variable, representing the extent to which securities trading processes have been digitalized to enhance trading efficiency. The key indicators for trade automation include securities trade volume and average total market capitalization, which provide insights into the extent and effectiveness of automation in the securities markets.

On the other hand, transaction costs function as the moderating variable in this framework. These costs encompass brokerage costs, taxes, clearing and settlement costs, custodial fees, and exchange fees. Transaction costs can either facilitate or hinder the benefits of trade automation

by influencing the cost-effectiveness of trading activities. High transaction costs may offset the efficiency gains of automation, while lower costs may enhance market liquidity and participation.

The dependent variable in this study is market performance, which is primarily measured by market liquidity. Market liquidity reflects the ease with which securities can be bought or sold without significantly affecting their prices. Higher liquidity levels are indicative of well-functioning markets that effectively facilitate trading activities and attract investors. The conceptual framework hypothesizes that trade automation directly influences market performance, with transaction costs serving as a moderating variable. The framework provides a comprehensive view of how these elements interact to shape the performance of securities markets in the EAC region.

### **3.1 Methods and Materials**

#### **Research Design**

In order to explore the relationships between trade automation, transaction costs, and the performance of securities markets within the EAC, a descriptive cross-sectional research design was employed. The descriptive design was particularly suited to this study as it allows for a detailed exploration of these relationships at a specific point in time. Employing this design allowed the study to effectively explore and describe the associations among the variables without necessitating intervention or manipulation from the researcher, thus offering a detailed understanding of the underlying market changing aspects.

#### **Target Population**

The securities markets in the EAC during the study period served as the unit of analysis. Specifically, the study focused on the four active securities exchanges in the region (refer to Appendix One), which include the NSE, USE, DSE and RSE. These markets were chosen because they are the only operational securities exchanges within the EAC member states, offering a thorough representation of the market dynamics in the region.

Given the limited number of securities markets within the EAC, the study employed a cross-sectional survey covering all four of these exchanges. The small sample size allowed for an in-depth analysis of each market, ensuring that the study captured the unique characteristics and dynamics of securities trading within each exchange. The cross-sectional survey approach was particularly suitable for this research, as it enabled the collection of data from all relevant markets within a specific time frame, allowing for comparative analysis across the different exchanges (Möttus et al., 2020).

It is imperative to keep in mind that the securities markets in Somalia, Burundi, South Sudan, and the DRC were excluded from this study. These countries, although part of the broader East African region, did not have functioning securities exchanges at the time and therefore did not meet the criteria for inclusion in this analysis. The exclusion of these markets ensured that the study remained focused on the operational securities exchanges within the EAC, allowing for a more precise and relevant analysis of market performance in the region.

Furthermore, conducting a survey with a small sample size was not prohibitively expensive, particularly when the geographical distribution of the organizations under study was manageable. In the context of this research, the securities exchanges were relatively well distributed within the EAC, making it feasible to conduct a comprehensive cross-sectional survey. This approach not only maximized the depth of analysis but also ensured that the findings were representative of the securities markets within the region.

**Data Collection and Operationalization of Study Variables**

The study collected secondary data from annual audited financial documents, annual capital markets authorities' publications, and daily trading reports of the securities exchanges for the ten-year period from 2015 to 2024. The specific data collected included annual trading volumes, annual average total market capitalization, annual average trade frequencies, annual trading patterns, annual technology and systems expenditures, annual Business to Business (B2B) transaction volumes, annual Business to Customer (B2C) transaction volumes, annual brokerage fees, annual exchange fees, annual custodial fees, annual clearing and settlement fees, bid-ask spreads, and price impact. The research variable(s) specifically; trade automation, transaction costs and securities markets performance are measured as summarized below.

**Table 1 Study Variables, Measurement and Comparison with Previous Studies**

| Variable          | Indicator                                             | Operational Definition                                                                            | Measurement                                                  | Adapted From                     |
|-------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------|
| Trade Automation  | Volume of shares traded in respective security market | This is the total volume of shares that are traded due to trade automation in the security market | Percentage change in volume traded as a result of automation | Hasan, Shamsuddin & Vigne (2021) |
|                   |                                                       |                                                                                                   |                                                              |                                  |
| Transaction Costs | Brokerage Fees                                        | Charges levied by brokerage firms                                                                 | Quoted Percentage                                            | Schrimpf & Sushko (2020)         |
|                   | Exchange Fees                                         | Charges for executing a buy or sell order                                                         | Quoted Percentage                                            | Biais, Foucault & Moinas (2021)  |
|                   | Custodial Fees                                        | Charges by the custodian for holding and safekeeping the investor's securities                    | Quoted Percentage                                            | Haferkorn & Zimmermann (2020)    |
|                   | Clearing & Settlement fees                            | Charges by the Central Depository and Settlement Corporation (CDSC) for settling the trade        | Quoted Percentage                                            | Ackert, Qi & Zou (2022).         |
| Performance       | Market Liquidity                                      | Market Turnover Ratio                                                                             | Total Value Traded/ Average Total Market Capitalization      | Hefei and Zhang (2020)           |

**4.1 Data Analysis**

In order to analyze the data and produce insightful findings, the study used Stata software. To examine the connections among the variables being studied, regression analysis was utilized. The findings of diagnostic tests conducted to guarantee the panel data models' resilience are shown in this section. Tests to verify the assumptions of panel data analysis were performed. These tests included assessing normality to ensure that residuals were normally distributed, linearity tests to confirm a linear association between the explanatory and dependent variables, and checks for multicollinearity to identify any correlations between explanatory variables that might affect the analysis. Further tests included heteroscedasticity to verify that residuals had constant variance across observations, and autocorrelation to ensure that residuals were not correlated over time. Additionally, stationarity tests were performed to confirm that the

variables in the panel data were stationary, thus avoiding issues related to non-stationary data. Furthermore cross sectional dependence as well as model specification tests were considered. These diagnostic tests collectively validate the reliability and accuracy of the panel data analysis, ensuring that the results are robust and interpretable.

The specification test were employed to ensure the reliability and robustness of the panel regression models used in the study. It includes an evaluation of the assumption on outliers, the selection between fixed-effects and random-effects models, and the application of the Hausman test to determine the most appropriate model for the dataset. These tests were crucial in validating the consistency and efficiency of the estimators, accounting for both cross-sectional and time-series dimensions of the panel data. Outliers in panel data can distort the results by causing heteroscedasticity or unequal variances (Adams et al., 2019). It is argued that panel fixed-effects models could mitigate issues related to heteroscedasticity by controlling for time-invariant characteristics, thereby providing more accurate estimations in the presence of outliers or unequal variances (deHaan, 2021). Given that panel data included both time series and cross-sectional elements, choosing the suitable model was essential for accurate analysis.

The decision between the suitable models (fixed versus random) is crucial for this study, which used panel data to explore the effects of trade automation, and transaction costs. When individual-specific intercepts were associated with the regressors, the fixed-effects model is suitable because it permits management of time-invariant features that could affect the dependent variable (deHaan, 2021). In these situations, this model provides more accurate estimates by taking into consideration the individual effects as a component of the intercept. On the other hand, because it eliminated the need to estimate numerous cross-sectional intercepts, the random-effects model was useful for research with fewer degrees of freedom. It makes the postulation that discrete effects are uncorrelated with the regressors.

The Hausman model selection and specification test looks at whether the individual-specific effects are correlated with the explanatory variables, which aids in choosing between the two models. If the  $p < .05$ , the fixed-effects model is deemed more appropriate (Baltagi, 2024). This approach helps ensure that the model accurately reflects the dynamic interactions between trade automation and transaction costs in the panel data setting. The fixed-effects model was used if individual effects are found to correlate with regressors, otherwise, the random-effects model was considered (Hausman, 1978). The effect of the link between the research variables through regression analysis was evaluated. The research objectives, hypotheses, and analytical techniques employed in the estimation is summarized in Table 2.

Table 2 Research Objective, Hypotheses, Analytical Methods and Interpretation

| Objective                                                                                                                                                  | Hypotheses                                                                                                                                                                   | Analytical methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Interpretation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| To establish the effect of transaction costs on the relationship between trade automation and performance of securities markets in East African Community. | H <sub>0</sub> : Transaction costs do not significantly influence the relationship between trade automation and performance of securities markets in East African Community. | Baron and Kenny three step procedure<br><br>Hierarchical Regression Analysis<br><br>Step 1 : $PERF_{it} = \alpha + \beta_1 TA + \varepsilon$<br><br>Step2 : $PERF_{it} = \alpha + \beta_1 TA + \beta_2 TC + \varepsilon$<br><br>Step 3 : $PERF_{it} = \alpha + \beta_1 TA + \beta_2 TC + \beta_3 TA.TC + \varepsilon$<br><br>$\alpha$ =constant (intercept), $\beta_1, \beta_2, \beta_3$ = coefficients<br><br>TA= Trade Automation; TC= Transaction Costs; TA.TC= Interaction term for Trade Automation and Transaction Costs interaction; $\varepsilon$ = Error term | Moderation is confirmed if the coefficient $\beta_3$ is statistically significant ( $p < 0.05$ ). A positive $\beta_3$ would suggest that transaction costs amplify the effect of trade automation on market performance, while a negative $\beta_3$ would indicate a weakening effect. If $\beta_3$ is not significant, then transaction costs do not moderate the relationship between trade automation and performance, and their interaction has no influence on market outcomes in this context. |

4.2 Results

The analysis assessed the central tendency and variation within the panel data, providing an overview of the dataset’s characteristics and its range of values. The results of the descriptive statistics for the study variables are summarized in Table 3 below.

Table 1 Summary Statistics

| Variable                            | Observations | Mean   | Std. Dev. | Min    | Max     |
|-------------------------------------|--------------|--------|-----------|--------|---------|
| Average Total Market Capitalization | 40           | 6.2999 | 2.4208    | 2.2979 | 11.7974 |
| Percentage change in volume traded  | 40           | .0486  | .0170     | .02    | .09     |
| Brokerage Fees                      | 40           | .5035  | .1350     | .23    | .75     |
| Exchange Fees                       | 40           | .5259  | .1512     | .257   | .8055   |
| Custodial Fees                      | 40           | .4669  | .1211     | .26    | .69     |
| Clearing & Settlement fees          | 40           | .5088  | .1164     | .31    | .7092   |

Source: Researcher Calculations based on Secondary Data (2015-2024)

The descriptive statistics outlined in table 3 above provide a detailed overview of market capitalization, trading volumes, and transaction fees. The Average Total Market Capitalization (ATMC), which represents the dependent variable, has a mean of approximately 6.3 million USD, with values ranging from a minimum of about 2.3 million USD to a maximum of nearly 11.8 million USD. The standard deviation of 2.42 million USD suggests moderate variability, indicating differences in market sizes across the different securities markets over the 10-year period. These variations reflect the relative differences in market performance and the overall

size of each market in terms of listed equity value. For the Percentage Change in Volume Traded (PVT), the mean is 4.86%, with a standard deviation of 1.70%, indicating moderate fluctuations around the average value. The range (2-9%) demonstrates periods of both low and high trading activity, influenced by market liquidity, investor behavior, and economic conditions that varied across markets and years.

Regarding transaction costs, Brokerage Fees (BF) have an average rate of 50.35% and a standard deviation of 13.50%, indicating noticeable variability across markets or brokers. The wide range from 23% to 75% reflects substantial differences in trading costs, which can affect market participation and liquidity. Similarly, Exchange Fees (EF) have a mean of 52.59% and a standard deviation of 15.12%, with fees ranging from 25.7% to 80.55%. These variations suggest that transaction costs could significantly impact investor decisions and market attractiveness.

The Custodial Fees (CF) and Clearing & Settlement Fees (CSF) also exhibit variability, with means of 46.69% and 50.88%, respectively, and standard deviations of 12.11% and 11.64%. The range of custodial fees from 26% to 69%, and clearing and settlement fees from 31% to 70.92%, highlight differences in market infrastructures and cost structures. These fees are crucial for investors as they directly affect the net returns on their investments, influencing overall market participation. Collectively, these statistics reveal diverse conditions in the East African securities markets, shaped by differences in market size, efficiency, and transaction costs, providing insights into the trading environment and its evolution over the study period.

This study's goal was to ascertain how transaction costs affected the connection between trade automation and the East African Community's securities markets' performance. The null hypothesis was developed as a result:  $H_0$ : The link between trade automation and the performance of the East African Community's securities markets is not substantially impacted by transaction costs. Brokerage Fees (BF), Exchange Fees (EF), Custodial Fees (CF), and Clearing & Settlement Fees (CSF) were the several transaction cost types that were the subject of the multi-step research that was conducted to evaluate this hypothesis.

To examine the potential moderating effect of transaction costs, a hierarchical regression analysis was conducted using Baron and Kenny's (1986) three-step procedure. The first step assessed the direct effect of trade automation (PTV) on market performance (TMC). The model used in this step is:

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \epsilon_{it}$$

where  $TMC_{it}$  represents market performance,  $\alpha$  is the intercept,  $\beta_1$  is the coefficient for trade automation, and  $\epsilon_{it}$  is the error term.

The second step added each type of transaction cost to the model to observe their direct impact alongside trade automation. The models for this step are:

For Brokerage Fees (BF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 BF_{it} + \epsilon_{it}$$

For Exchange Fees (EF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 EF_{it} + \epsilon_{it}$$

For Custodial Fees (CF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 CF_{it} + \epsilon_{it}$$

For Clearing & Settlement Fees (CSF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 CSF_{it} + \epsilon_{it}$$

In these equations,  $\beta_2$  represents the direct effect of each type of transaction cost on market performance.

In the third step, interaction terms between trade automation and each type of transaction cost were introduced to determine whether transaction costs moderate the link between trade automation and market performance. The interaction terms were created by multiplying the standardized scores of trade automation and each type of transaction cost, such as PTV\_BF, PTV\_EF, PTV\_CF, and PTV\_CSF. The models for this step are:

For Brokerage Fees (BF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 BF_{it} + \beta_3 (PTV_{it} \times BF_{it}) + \epsilon_{it}$$

For Exchange Fees (EF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 EF_{it} + \beta_3 (PTV_{it} \times EF_{it}) + \epsilon_{it}$$

For Custodial Fees (CF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 CF_{it} + \beta_3 (PTV_{it} \times CF_{it}) + \epsilon_{it}$$

For Clearing & Settlement Fees (CSF):

$$TMC_{it} = \alpha + \beta_1 PTV_{it} + \beta_2 CSF_{it} + \beta_3 (PTV_{it} \times CSF_{it}) + \epsilon_{it}$$

In these models,  $\beta_3$  represents the coefficient for the interaction terms, capturing the moderating effect of transaction costs on the relationship between trade automation and market performance. To account for differences between securities markets, either fixed-effects or random-effects models were applied at each stage. For each set of variables, the Hausman test was used to determine which of the fixed effects and random effects models was best. According to Baron and Kenny (1986), the third step's interaction terms' significance would show that transaction costs have a major moderating effect on the link between trade automation and market performance. Table 4 displays the findings from these analyses.

**Table 4: Effect of Transaction Costs on the Relationship Between Trade Automation and Performance**

| Variable                  | Step 1            |         | Step 2            |         | Step 3                             |         |
|---------------------------|-------------------|---------|-------------------|---------|------------------------------------|---------|
| Market Performance        | Coefficient       | P-value | Coefficient       | P-value | Coefficient                        | P-value |
| <b>Brokerage Fees</b>     |                   |         |                   |         |                                    |         |
| Trade automation (PVT)    | -27.72<br>(-2.25) | 0.025   | -2.40<br>(-0.21)  | 0.830   | -0.31<br>(-0.02)                   | 0.982   |
| Brokerage fees (BF)       |                   |         | -9.21<br>(-4.12)  | 0.000   | -10.25<br>(-3.50)                  | 0.002   |
| Interaction term (PVT_BF) |                   |         |                   |         | <b>-12.87342</b><br><b>(-0.40)</b> | 0.691   |
| Constant                  | -.51              | 0.028   | 10.83             | 0.000   | 11.71                              | 0.000   |
| Number of Observations    | 34                |         | 36                |         | 36                                 |         |
| R-squared                 | 0.1209            |         | 0.0181            |         | 0.0182                             |         |
| F-statistic/ Wald chi2    | 5.04              |         | 17.36             |         | 13.04                              |         |
| Prob > F/ Prob > chi2     | 0.0247            |         | 0.0002            |         | 0.0000                             |         |
| Hausman Chi2 (P-value)    | 0.9888            |         | 0.3479            |         | 0.0164                             |         |
| <b>Exchange Fees</b>      |                   |         |                   |         |                                    |         |
| Trade automation (PVT)    | -27.72<br>(-2.25) | 0.025   | -6.18<br>(-0.66)  | 0.507   | -9.89<br>(-0.48)                   | 0.634   |
| Exchange fees (EF)        |                   |         | -7.82<br>(-5.47)  | 0.000   | -9.09<br>(-2.66)                   | 0.008   |
| Interaction term (PVT_EF) |                   |         |                   |         | <b>10.48</b><br><b>(0.23)</b>      | 0.815   |
| Constant                  | -.51              | 0.028   | 10.28             | 0.000   | 10.69                              | 0.000   |
| Number of Observations    | 34                |         | 36                |         | 36                                 |         |
| R-squared                 | 0.1209            |         | 0.2731            |         | 0.2743                             |         |
| F-statistic/ Wald chi2    | 5.04              |         | 30.54             |         | 12.10                              |         |
| Prob > F/ Prob > chi2     | 0.0247            |         | 0.0000            |         | 0.0071                             |         |
| Hausman Chi2 (P-value)    | 0.9888            |         | 0.9992            |         | 0.4084                             |         |
| <b>Custodial Fees</b>     |                   |         |                   |         |                                    |         |
| Trade automation (PVT)    | -27.72<br>(-2.25) | 0.025   | -10.84<br>(-1.10) | 0.272   | -5.24<br>(-0.39)                   | 0.697   |
| Custodial fees (CF)       |                   |         | -.13<br>(-2.23)   | 0.026   | -.06<br>(-2.71)                    | 0.007   |
| Interaction term (PVT_CF) |                   |         |                   |         | <b>-15.81</b><br><b>(-0.64)</b>    | 0.522   |
| Constant                  | -.51              | 0.028   | -.06              | 0.672   | -.13                               | 0.826   |
| Number of Observations    | 34                |         | 36                |         | 36                                 |         |
| R-squared                 | 0.1209            |         | 0.2163            |         | 0.1241                             |         |
| F-statistic/ Wald chi2    | 5.04              |         | 7.40              |         | 7.88                               |         |
| Prob > F/ Prob > chi2     | 0.0247            |         | 0.0247            |         | 0.0486                             |         |
| Hausman Chi2 (P-value)    | 0.9888            |         | 0.5063            |         | 0.9979                             |         |

| Clearing & Settlement Fees       |                   |       |                   |       |                                   |       |
|----------------------------------|-------------------|-------|-------------------|-------|-----------------------------------|-------|
| Trade automation (PVT)           | -27.72<br>(-2.25) | 0.025 | -16.67<br>(-1.96) | 0.050 | -7.95<br>(-0.53)                  | 0.593 |
| Clearing & Settlement Fees (CSF) |                   |       | 0.06<br>(1.33)    | 0.184 | 0.04<br>(0.83)                    | 0.409 |
| Interaction term (PVT_CSF)       |                   |       |                   |       | <b>-90.8259</b><br><b>(-2.51)</b> | 0.018 |
| Constant                         | -.51              | 0.028 | -.55              | 0.622 | -.36                              | 0.393 |
| Number of Observations           | 34                |       | 34                |       | 36                                |       |
| R-squared                        | 0.1209            |       | 0.2242            |       | 0.0746                            |       |
| F-statistic/ Wald chi2           | 5.04              |       | 6.07              |       | 19.79                             |       |
| Prob > F/ Prob > chi2            | 0.0247            |       | 0.0481            |       | 0.0002                            |       |
| Hausman Chi2 (P-value)           | 0.9888            |       | 0.9826            |       | 0.8839                            |       |

NB: Values in parenthesis are t statistics;

Source: Author’s Computation based on secondary data

From Table 4, the model fitness statistics provide valuable context to the findings, particularly in assessing how well the models explain the relationships between transaction costs, trade automation, and market performance. For brokerage fees, the R-squared values range from 0.0181 to 0.1209, indicating that the models explain a small proportion of the variability in market performance. However, the significant Wald chi-square statistic ( $p<0.05$ ) suggests the model is statistically meaningful in capturing the relationship, despite its limited explanatory power. This reflects the influence of additional unmeasured factors beyond brokerage fees.

Incorporating exchange fees results in stronger model fitness, with R-squared values reaching 0.2743. This indicates that up to 27.4% of the variance in market performance is explained, making exchange fees a more robust predictor compared to brokerage fees. The Wald chi-square statistic is also highly significant ( $p=0.0071$ ), reinforcing the importance of exchange fees in the analysis.

The models for custodial fees demonstrate moderate fitness, with R-squared values peaking at 0.2163. While these values reflect limited explanatory power, the significant chi-square statistic ( $p=0.0486$ ) indicates that custodial fees contribute meaningfully to explaining market performance. However, the model highlights the potential need for additional variables or improved measures of custodial fees.

For clearing and settlement fees, the models show moderate fitness, with R-squared values of 0.2242 in Step 2 and 0.0746 in Step 3. Although the explanatory power decreases when interaction terms are introduced, the significant chi-square statistics, especially in Step 3 ( $p=0.0002$ ), confirm that clearing and settlement fees significantly influence market performance, particularly through their interaction with trade automation. Overall, while R-squared values vary across models, the consistent significance of the Wald chi-square statistics underscores that transaction costs dimensions play an important role in explaining market performance. Exchange fees exhibit the strongest model fitness, followed by custodial and clearing fees, with brokerage fees showing relatively weaker explanatory power. The results highlight the complexity of financial market dynamics and the critical role of transaction costs within the EAC securities markets.

To decide on the ideal model for evaluating the impact of transaction costs on trade automation and securities market performance, model selection was conducted using the Hausman test. The Hausman test results indicate that for brokerage fees, the random effects for the first two steps were more appropriate while the fixed-effects model is more appropriate for the third step due to a p-value of 0.0164, suggesting the presence of individual-specific effects. For exchange fees, custodial fees, and clearing & settlement fees, the Hausman test p-values exceed 0.05, indicating that random-effects models are better suited for these variables in all the three steps.

The study indicated that trade automation in the first step was significant. In the second step, trade automation became insignificant ( $p > 0.05$ ) while brokerage fee was statistically significant ( $p < 0.05$ ). In the third step, the coefficient for brokerage fee demonstrated a significant negative impact on market performance. However, the interaction term between trade automation and brokerage fee (PVT\_BF) was not significant ( $p > 0.05$ ), suggesting that brokerage fees do not moderate the relationship between trade automation and market performance. Therefore, while brokerage fees significantly influence market performance, they do not affect how trade automation impacts it. This resulted to not rejecting the null hypothesis regarding the moderating effect of transaction costs in terms of brokerage fee on the connection between trade automation and performance of market securities in EAC.

For exchange fees and custodial fees, in the second step revealed same trends as brokerage fee whereby trade automation was insignificant while both exchange fees and custodial fees were statistically significant ( $p < 0.05$ ) in their respectful models. The interaction terms in the third steps between trade automation and exchange fees (PVT\_EF), as well as between trade automation and custodial fees (PVT\_CF) were statistically not significant ( $p > 0.05$ ), which means exchange fees or custodial fees do not significantly moderate the relationship between trade automation and market performance of securities in EAC respectively. This led to the failure of rejecting the null hypotheses regarding the moderating effect of transaction costs in terms of either exchange fees or custodial fees on the relationship between trade automation and performance of market securities in EAC.

In the case of clearing & settlement fees, the first step demonstrated significance between trade automation and performance of market securities. In the second step, upon introduction of the moderators, trading automation-maintained significance while clearing & settlement fees became non-significant. Additionally, the interaction term (PVT\_CSF) in the third step was statistically significant ( $p < 0.05$ ), suggesting that clearing & settlement fees do moderate the relationship between trade automation and market securities performance. Thus, the hypothesis is rejected for moderating effect of clearing & settlement fees.

The study's findings indicate that transaction costs have a direct negative effect on market performance but do not significantly moderate the relationship between trade automation and market performance in the EAC. While brokerage fees, exchange fees, and custodial fees negatively impact market performance, they do not meaningfully alter the effect of trade automation. A key exception in the study is the significant moderating role of clearing and settlement fees, which suggests that this cost category plays a unique role in shaping market dynamics. Unlike custodial fees, which had no significant impact, clearing and settlement fees influence the way trade automation affects performance, highlighting the importance of post-trade processes in performance.

### 4.3 Discussion of the Research Findings

The analysis revealed a complex interplay: while several transaction cost components namely brokerage fees, exchange fees, and custodial fees exert a significant direct negative effect on market performance, their role as moderators of the automation performance nexus is limited.

The only cost component found to significantly moderate the relationship was clearing and settlement fees. This indicates that while trade automation may influence performance through efficiency and volume, the burden of transaction-related expenses can either erode or reinforce those effects depending on the specific cost category involved. These findings echo recent observations by Cuypers et al. (2021), who examined the evolving role of Transaction Cost Theory in modern financial systems. Their review stressed that while automation technologies may reduce coordination costs and enhance transactional precision, they do not uniformly diminish all categories of transaction costs. In particular, costs related to post-trade settlement and custodianship tend to persist or even increase due to compliance burdens or platform integration issues. The current study aligns with these conclusions by highlighting that although automation can streamline trade execution, its benefits are often undermined by high brokerage and custodial charges, especially in fragmented or underdeveloped markets.

Tao et al. (2021) further reinforce this perspective through their comparative analysis of robo-advisors versus traditional investment platforms. Their results demonstrated that while automated systems offer cost advantages in managing portfolios, these efficiencies do not always translate into broader reductions in transaction expenses. The current study finds similar patterns: although automation has the potential to reduce information asymmetries and improve trade execution, the high persistence of trading costs especially in manual back-office processes dilutes its overall effect on market performance. Thus, transaction costs remain a structural constraint that limits the transformative capacity of trade automation in EAC markets.

Of particular interest is the significant moderating role played by clearing and settlement fees, which directly influenced the relationship between automation and performance. Roeck, Sternberg, and Hofmann (2020), in their analysis of distributed ledger technologies (DLT) and transaction coordination in supply chains, found that digitized settlement mechanisms could substantially lower post-trade frictions. Applying their insights to the financial context, the present findings suggest that optimizing clearing and settlement infrastructure could unlock significant efficiency gains. This is especially important for EAC exchanges where manual reconciliation processes and institutional lags still inflate settlement costs and reduce system responsiveness.

The negligible moderating influence of brokerage and exchange fees, despite their direct negative effect, suggests a more nuanced dynamic. As discussed by Bhatia et al. (2024), transaction costs that occur upstream in the trade lifecycle (e.g., broker commissions or exchange levies) are less likely to interfere with the execution performance of automated systems when compared to downstream costs like settlement. This distinction is critical in designing regulatory interventions, as it indicates that performance bottlenecks may not solely stem from point-of-sale trading costs but from inefficiencies in infrastructure that affect trade finality and investor confidence.

Lastly, the absence of a significant moderating effect from custodial fees supports the argument advanced by Shah and Allam (2020), who examined the application of blockchain-based smart contracts in tradable permit schemes. While smart contracts were shown to increase transactional transparency and reduce administrative overhead, their cost-reduction impact was more pronounced in dynamic trading activities than in static custodial services. Likewise, in the context of EAC markets, the relative insignificance of custodial fees as a moderator suggests that their impact on automated trade performance is marginal, although their cumulative effect on investor behavior remains relevant. These findings reaffirm the importance of differentiating between transaction cost categories when assessing automation's market effects and designing reforms tailored to specific friction points in the trading infrastructure.

## 5.1 Conclusions of the Study

The findings reveal several important insights into the impact of trade automation and transaction costs on the performance of securities markets in the EAC. First, the results indicated that trade automation, measured by the percentage of volume traded, has a statistically noteworthy negative effect on market performance. Specifically, an upsurge in trade automation is associated with a decrease in market performance. This suggests that merely adopting automated trading systems may not suffice to enhance market performance. The results implied that other factors, such as technological quality, market liquidity, and regulatory frameworks, may play more pivotal roles in improving market performance.

The study found that transaction costs, particularly brokerage fees, significantly influenced market performance. Brokerage fees were associated with an important negative impact on market performance, suggesting that increased costs could deter trading activity and reduce market performance. Although other transaction costs like exchange fees, custodial fees, and clearing and settlement fees did not show significant individual effects, clearing and settlement fees were discovered to regulate the connection between trade automation and market performance. Addressing and reducing transaction costs, particularly brokerage fees, could enhance the positive effects of trade automation on market performance.

The findings challenged the widely held notion that trade automation inherently improved market performance. Instead, the study demonstrated that in the EAC context, increased trade automation correlated with a statistically significant decline in market performance. This result offered a critical contribution to knowledge by showing that the success of automation is not universally transferable. It is shaped by the maturity of market systems, the level of digital adoption, and the capacity of institutions to support real-time electronic trading. This challenges earlier assumptions embedded in trade automation theory and calls for a more comprehensive understanding of technology's role in fragmented and illiquid markets.

A further contribution lies in the study's modeling of interdependencies between trade automation and transaction costs. Previous research tended to evaluate these elements in isolation. This study broke new ground by conceptualizing and empirically testing their moderating effects within an integrated framework. It revealed that the net effect on performance can be offset by high transaction costs particularly brokerage and clearing fees. This approach advanced theoretical discourse by validating the conditional pathways through which automation affects market outcomes, rather than treating automation as an exogenous or uniformly beneficial intervention.

The study also added depth to the understanding of transaction cost economics and the efficient market hypothesis by operationalizing real-world market frictions. By including measurable cost elements such as bid-ask spreads, custodial fees, and exchange charges in its models, the study provided practical and testable extensions to these foundational theories. It contributed to the literature by showing that in less efficient, cost-intensive environments, automation's performance-enhancing potential is significantly diminished. This insight is particularly valuable for policy design, as it identified which structural barriers must be addressed before automation reforms can yield their intended impact.

Lastly, the use of longitudinal panel data across a ten-year period enhanced the robustness of the conclusions and introduces a time-sensitive perspective that is often absent in cross-sectional studies. This longitudinal view allowed for the identification of evolving trends and delayed impacts of automation and cost dynamics, making the study's insights particularly relevant for developing markets that are gradually transitioning to digital trading platforms. By

capturing both structural constraints and temporal dynamics, the study contributed a richer, multi-dimensional understanding of market performance drivers in emerging financial systems.

The findings offered significant insights for policymakers and regulatory bodies within the East African Community, providing a clear direction for improving market dynamics. For policymakers, this implies a pressing need to address and reduce these transaction costs through strategic reforms. Implementing policies aimed at lowering trading costs, such as streamlining procedures and reducing fees, policymakers can help ensure that the advantages of automation are fully realized.

For market regulators, the research highlighted the importance of adopting a holistic regulatory approach that encompasses more than just the promotion of trade automation. It suggested that effective regulation should address various interconnected factors including transaction costs. Integrating these elements into regulatory frameworks, regulators can create a more balanced trading environment that fosters both innovation and fairness. This comprehensive approach is crucial for improving market performance, as it ensures that the benefits of automation are not undermined by high costs or inefficiencies. Therefore, regulators are encouraged to develop and implement policies that consider the interplay between these factors, thereby creating a more conducive environment for trading and investment.

Financial practitioners and investors also stand to benefit from the findings. The research underscored the significance of understanding how transaction costs and trade automation interact with each other. For practitioners, this knowledge can be instrumental in optimizing transaction costs and leveraging markets to improve trading outcomes. Investors can use these insights to refine their investment strategies, making more informed decisions that take into account the cost-efficiency and effectiveness of their trading activities. Through application of these insights, financial practitioners can enhance their operational practices, leading to better market performance and potentially higher returns on investments.

## 5.2 Suggestions for Future Research

Forthcoming exploration could benefit from expanding the analysis to incorporate additional factors that influence securities market performance. Key elements such as macroeconomic variables, political stability, and investor sentiment were not included in the current study but are known to significantly impact market dynamics. Factors like inflation rates, interest rates, and GDP growth are essential in influencing market conditions and performance. Political stability can affect market confidence and investment flows, while investor sentiment can drive market trends and volatility. Through inclusion of these variables in future studies, researchers could gain a more comprehensive understanding of how they interact with trade automation, transaction costs, thereby providing a fuller picture of market dynamics.

Moreover, investigating technological advancements beyond trade automation could offer valuable insights into their effects on market performance. New technologies like artificial intelligence (AI) and machine learning have the ability to revolutionize trading strategies and market activities. AI and machine learning can enhance predictive analytics, algorithmic trading, and risk management, potentially leading to significant changes in market behavior. Future research could explore how these advanced technologies influence market performance, comparing their impacts with those of traditional trade automation methods. This would help in understanding the broader implications of technological innovation on financial markets and its potential benefits and risks.

Extending the study to other regions or countries with different economic conditions and market structures could provide a comparative analysis that enhances the generalizability of the

findings., regulatory environments, and economic conditions. Comparative studies could reveal regional or country-specific factors that influence market performance, offering insights into how these variables interact in diverse financial environments. This approach would contribute to a broader perspective on the effects of trade automation and related factors on securities markets globally.

Given the dynamic nature of financial markets, it is vital to understand how the relationships between trade automation and transaction costs evolve. Longitudinal studies could track these variables over extended periods, providing insights into trends and shifts in market behavior. This approach would allow researchers to identify patterns and changes in the influence of trade automation and other factors on market performance, offering a deeper understanding of their long-term effects. Furthermore, different markets have varying levels of infrastructure sophistication and regulatory environments, this may affect how effective trade automation and its impact on market performance. Future research could investigate how this infrastructure and regulatory differences affect the outcomes of trade automation and transaction costs. Understanding these interactions could help in designing more effective policies and strategies for improving market performance in different contexts.

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