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THE IMPACT OF MOBILE TRADING ADOPTION ON FINANCIAL PERFORMANCE AND MARKET VALUATION: EVIDENCE FROM DAR ES SALAAM STOCK EXCHANGE PLC (2018–2024)

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ABSTRACT

This study assesses whether Dar es Salaam Stock Exchange PLC's adoption and scaling of the Mobile Trading Platform ("Hisa Kiganjani") coincided with changes in accounting-based financial performance and market valuation. Using a paired pre–post design, it compares 2017–2020 (pre) with 2022–2025 (post), excluding 2021 as a transition year. Five ratios (CR, ROA, DAR, DER, TATO) are combined into a standardized composite Financial Performance (FP) index, and year-end closing price is used as a proxy for market valuation. With four matched pairs, Wilcoxon signed-rank tests indicate no statistically significant shift in the FP index (W = 2.0, p = 0.375) and a directional but statistically non-significant increase in share price (W = 0.0, p = 0.125). Descriptively, 2025 shows increased mobile participation and turnover alongside trading-rule reforms. Overall results suggest an indicative pattern consistent with a gradual absorption interpretation, where valuation effects strengthen as adoption scales and market design improves, while accounting ratios show no discrete change.

Keywords: *Dar es Salaam Stock Exchange; Hisa Kiganjani; Financial Ratios*

ABSTRAK

Penelitian ini menilai apakah adopsi dan peningkatan skala Platform Perdagangan Seluler ("Hisa Kiganjani") oleh Bursa Efek Dar es Salaam PLC bertepatan dengan perubahan kinerja keuangan berbasis akuntansi dan valuasi pasar. Menggunakan desain pra-pasca berpasangan, studi ini membandingkan tahun 2017–2020 (pra) dengan tahun 2022–2025 (pasca), tidak termasuk tahun 2021 sebagai tahun transisi. Lima rasio (CR, ROA, DAR, DER, TATO) digabungkan menjadi indeks Kinerja Keuangan (FP) komposit standar, dan harga penutupan akhir tahun digunakan sebagai proksi untuk valuasi pasar. Dengan empat pasangan yang cocok, uji peringkat bertanda Wilcoxon menunjukkan tidak ada pergeseran yang signifikan secara statistik pada indeks FP (W = 2,0, p = 0,375) dan peningkatan harga saham yang searah tetapi tidak signifikan secara statistik (W = 0,0, p = 0,125). Secara deskriptif, tahun 2025 menunjukkan peningkatan partisipasi dan perputaran seluler seiring dengan reformasi aturan perdagangan. Hasil keseluruhan menunjukkan pola indikatif yang konsisten dengan interpretasi penyerapan bertahap, di mana efek valuasi menguat seiring dengan peningkatan adopsi dan perbaikan desain pasar, sementara rasio akuntansi tidak menunjukkan perubahan yang signifikan.

Kata kunci: Akuisisi; Harga Saham; Kinerja Keuangan

Tanggal Masuk	Tanggal Revisi	Tanggal Diterima
12 Desember 2025	20 Februari 2026	27 Maret 2026

INTRODUCTION

Tanzania's capital market has expanded in listings, products, and disclosure practices over the past decade. It still exhibits structural features common to smaller emerging exchanges: thin trading volumes, limited analyst coverage, and concentrated retail ownership (International Monetary Fund, 2003). Peer-reviewed evidence on the Dar es Salaam Stock Exchange (DSE) suggests that price adjustment can be gradual, and that weak-form efficiency is not guaranteed in all periods, a feature that can mute or delay the market response to new trading infrastructure and information channels (Njuguna, 2016).

Against this backdrop, digital access has become one of the most practical levers for broadening retail participation and reducing frictions that keep investors outside the market. The global evidence base on online and mobile trading adoption shows that uptake is shaped by perceived benefits, trust, and behavioral control, and that improved access can change trading intensity and portfolio behavior, although the direction of welfare effects depends on investor capability and usage patterns (Chong et al., 2021; Freibauer et al., 2024; Lee, 2009). For a market such as Tanzania, where participation depth remains a central development constraint, a mobile channel can therefore be understood as a market-deepening intervention rather than a purely technical upgrade.

DSE Plc is both the operator of the securities exchange and, since its self-listing, a firm whose performance is evaluated by the market. Its income model blends operational revenues (listing-related fees, transaction and service fees, registry and data services) with investment income generated from a sizable portfolio of financial assets. This mix matters for inference: even if a digital access tool expands participation, the effect may be absorbed through changes in revenue composition, cost structure, and investment returns, rather than showing up as a sharp break in conventional accounting ratios.

Importantly, the operational and valuation effects of mobile access are unlikely to concentrate in branding year alone because adoption and liquidity are jointly determined by user learning dynamics and market microstructure. Evidence from DSE's 2025 market performance briefly highlights that major microstructure reform implemented on 2 June 2025 introduced VWAP-based closing prices, revised price-variation caps and block-trade rules, and extended trading hours explicitly to improve price discovery and unlock liquidity (DSE LPC, 2026; Hamidi & Chavoshi, 2018). These post-2024 reforms coincide with a marked expansion of activity on the Mobile Trading Platform ("Hisa Kiganjani"), suggesting that mobile access may operate most strongly when complemented by liquidity-enhancing rules rather than as a standalone technological change.

In 2021, DSE advanced the institutionalization of its mobile trading channel by registering DSE brands and the mobile trading platform name "*Hisa Kiganjani*" as intellectual property, while continuing to stabilize and scale trading-related ICT systems developed in 2020, including the mobile trading platform for equities and bonds (DSE PLC, 2021). The initiative fits a clear economic logic: lowering the cost of access should expand retail reach, increase engagement, and potentially strengthen the exchange's fee-generating activity and visibility.

The expanded window begins in 2017, immediately after DSE Plc's post-demutualization listing phase (IPO in 2016) and during an early growth and capital-formation period. Including 2017 provides a baseline in which the firm's liquidity and profitability were shaped by the transition to a listed corporate form and a reconfigured balance sheet. The window is also extended to 2025, a year characterized by both the maturation of mobile trading adoption and a discrete set of market microstructure reforms implemented on 2 June 2025 (including VWAP-based closing prices, revised price-variation caps, and revised block-trade rules). These developments allow the analysis to examine whether performance and valuation effects become more visible once user onboarding reaches scale and trading rules improve price discovery and liquidity.

This paper asks a focused question at the firm level: did DSE Plc's financial performance and share price differ before versus after the 2021 *Hisa Kiganjani* institutionalization? To answer, we apply a paired pre-post design comparing 2017-2020 with 2022-2025, excluding 2021 as a transition year. The approach follows comparative accounting-event logic, using a standard ratio toolkit and non-parametric inference suited to small, paired samples.

The contribution is twofold. First, it provides a transparent, replicable set of DSE Plc ratio calculations from audited statements and links them to a clearly dated digital-access intervention. Second, it complements macro-level evidence on ICT and market development in Africa (Igwilo & Sibindi, 2021) by testing whether an access-expansion initiative maps into firm-level accounting performance and valuation for the exchange itself.

The remainder of the article is organized as follows. The next section reviews theory and evidence on ratio-based performance, market valuation, and digital trading access, and develops hypotheses. The method section describes the design, data, variable measurement, and statistical procedures. Results are presented and interpreted in the context of DSE's business model and Tanzania's market structure, followed by conclusions and implications for future research.

LITERATUR REVIEW

Financial Performance and Ratio-Based Assessment

Financial ratio analysis is a standard tool for evaluating firm performance, condensing complex financial statements into interpretable signals of liquidity, profitability, leverage, and activity (Horrigan, 1965; Martikainen et al., 1995). In applied corporate-finance research, a common approach is to track a set of core ratios around a defined event or intervention and test whether the post-event profile differs from the pre-event profile (Sorescu et al., 2017).

The ratio set used in this study is widely applied in comparative accounting-event settings. Liquidity is represented by the current ratio (current assets divided by current liabilities), which measures short-term coverage; the current ratio is among the most widely employed liquidity metrics in accounting-based event studies, given its direct link to short-run solvency risk (Horrigan, 1965). Profitability is captured by return on

assets (ROA), defined as profit after tax relative to total assets; ROA is a standard profitability proxy across corporate finance and financial-services research and is used in performance benchmarking for financial infrastructure operators (Kliestik et al., 2020; Sripriya & Renuga Devi, 2024). Solvency is proxied through the debt-to-assets ratio (DAR) and debt-to-equity ratio (DER); both DAR and DER are standard leverage indicators used in financial stability assessments and accounting-event windows across sectors (Martikainen et al., 1995; Salah et al., 2021). Activity is represented by total asset turnover (TATO), which measures the intensity with which assets generate revenue and is particularly informative for asset-heavy firms such as exchange operators (Sripriya & Renuga Devi, 2024). The combination of one liquidity, one profitability, two leverage, and one activity ratio follows established multi-dimensional ratio frameworks used in comparative accounting studies (Kliestik et al., 2020; Sorescu et al., 2017). For a financial-services infrastructure firm such as DSE Plc, these ratios are informative because the balance sheet is asset-heavy (investment assets and deposits) while operating revenues depend on transaction-related activity and service delivery (Kliestik et al., 2020; Sripriya & Renuga Devi, 2024).

A key implication for interpretation is that, digital access initiatives may affect ratios through multiple, sometimes offsetting channels. Greater participation can support transaction and service revenues, but the cost of system development, onboarding, and marketing can dampen operating margins in the short run. For DSE Plc, investment income is also material and can dominate the year-to-year movement in ROA, potentially masking operational improvements in fee income. Accordingly, ratio-based testing should be read as evidence about net effects on the full financial model, not a direct measure of trading-app uptake alone (Salah et al., 2021).

Share Price, Information, and Market Structure Under Digital Access

Share price is a forward-looking summary of expected cash flows and risk, and in event-study logic it is the primary indicator of whether investors perceive an initiative as value-relevant. However, the speed and clarity of price adjustment depend on market structure and information frictions. Evidence specific to Tanzania indicates that weak-form efficiency is not assured and that price discovery may be slower in some periods, consistent with a market that can be affected by thin trading and limited breadth of participants (Njuguna, 2016).

The adoption literature on trading platforms helps specify when digital access could influence valuation. In online trading settings, perceived benefit and trust are central to adoption, while perceived risk can matter differently across user groups and market conditions (Chong et al., 2021; Lee, 2009). Beyond adoption, recent studies using investor-level data show that trading-app access can change trading frequency, risk-taking, and holding-period outcomes over time, highlighting behavioral channels that may increase turnover without guaranteeing superior investment performance (Freibauer et al., 2024). For an exchange operator, the valuation channel is therefore likely to operate through (i) higher sustainable fee income from deeper activity, (ii) improved strategic positioning and visibility, and (iii) a perceived strengthening of market infrastructure that reduces operational and reputational risk.

A practical complication is that share price is also shaped by broader macro-financial dynamics and market-wide sentiment. If market participation expands

generally, DSE Plc's own valuation may increase even if its accounting ratios do not show an immediate break. Conversely, if overall market turnover falls due to macro conditions, the benefits of improved access may be muted in both financial statements and market pricing(Haddad & Muir, 2025; Haslem, 2015).

Microstructure Reforms as Complements to Digital Access

Digital trading channels reduce access frictions, though their economic impact depends on whether market design supports continuous price discovery and executable liquidity. In thin markets, binding price-variation caps, limited closing-price mechanisms, and block-trade segmentation can dampen visible trading and slow the translation of participation gains into turnover (Li et al., 2023). Consistent with this complementarity logic, DSE implemented new trading rules on 2 June 2025 aimed at unlocking liquidity and improving price discovery, including VWAP-based closing prices and revisions to price-variation caps and block-trade rules. (DSE LPC, 2026).. This institutional feature implies that a mobile platform's value relevance may be realized more strongly in periods when trading rules allow prices to adjust and liquidity to surface, rather than immediately upon platform branding.

Digital Market Access as a Strategic Intervention at DSE Plc

From an exchange-development perspective, ICT adoption is frequently associated with stronger stock-market development outcomes. Evidence from African exchange panels suggests that ICT adoption is positively associated with stock market development indicators, supporting a view that digitalization can strengthen market functioning through information and participation channels (Igwilo & Sibindi, 2021, 2022).

At the firm level, DSE Plc's 2021 actions around *Hisa Kiganjani* can be interpreted as a strategic intervention with identifiable revenue and cost mechanisms. A mobile channel can reduce onboarding and access costs for retail investors, improve convenience, and widen geographic reach. These factors may translate into higher transaction-related revenues, stronger listing and issuer-services visibility, and incremental monetization of data and member services. At the same time, system maintenance, cybersecurity, customer support, and marketing can raise the operating cost base, and the net impact on profitability may depend on whether increased activity is large and persistent enough to offset these costs (Morosavljević et al., 2025).

The design choice to treat 2021 as a transition year is also consistent with how digital initiatives are implemented. DSE's reporting indicates continued stabilization of trading-related ICT systems developed in 2020, alongside the registration and formalization of the "*Hisa Kiganjani*" platform brand during 2021 (DSE PLC, 2021). In such cases, the economic effect is unlikely to concentrate on a single calendar date; it is more plausibly distributed across a rollout window, investor learning, and adoption cycles.

Comparative Accounting-Event Designs and Small-Sample Inference

Comparative accounting-event studies often operationalize interventions by splitting observations into pre and post periods and testing whether financial ratios or valuation proxies differ across matched years (Sorescu et al., 2017). When samples are

small or ratio distributions are non-normal, non-parametric procedures such as the Wilcoxon signed-rank test provide a conservative test of median differences without requiring normality (Wilcoxon, 1945). The cost of this conservatism is low statistical power in very small samples, which can lead to non-rejection even when directional changes are economically meaningful. This trade-off is particularly relevant for firm-level studies with limited time-series data, such as the present analysis (n = 4 matched pairs).

Hypotheses

Following the paired pre-post logic and the measurement framework described above, the hypotheses are stated as:

H1: DSE Plc's ratio-based financial performance is expected to improve in the post Hisa Kiganjani period (2022–2025) compared to the pre-period (2017–2020)

H2: DSE Plc's year-end share price **is expected to increase** in the post-Hisa Kiganjani period (2022–2025) compared to the pre-period (2017–2020).

RESEARCH METHOD

Research Design and Observation Window

The study employs a comparative pre-post design focused on a single DSE-listed company, DSE Plc. The design is consistent with accounting-event comparisons that evaluate whether a defined intervention coincides with a shift in financial ratios and market valuation.

The observation window is divided into: (i) a pre-intervention period (2017–2020), (ii) a transition year (2021), and (iii) a post-intervention period (2022–2025). Year 2021 is excluded from statistical testing because the Hisa Kiganjani channel was institutionalized during this year and the relevant effects are likely to be distributed across rollout, stabilization, and user learning. The 2017 financial statements cover an eighteen-month reporting period ended 31 December 2017 due to a change in reporting cycle; the study retains 2017 as baseline pre-period evidence but flags this comparability limitation.

Matched pairs are defined as (2017 vs 2022), (2018 vs 2023), (2019 vs 2024), and (2020 vs 2025). The rationale for this pairing requires clarification. The 2017 vs 2022 and 2018 vs 2023 pairs capture initial post-institutionalization effects at a five-year lag, acknowledging that adoption and liquidity effects take time to materialize as users learn the platform and transaction volumes build (Chong et al., 2021; Freibauer et al., 2024). The 2019 vs 2024 and 2020 vs 2025 pairs apply the same five-year interval consistently across all pre-period years, which is necessary for methodological symmetry: adopting a shorter lag for earlier pairs but longer for later pairs would introduce arbitrary asymmetry. Since mobile adoption is a cumulative process, the five-year interval allows each pre-year to be compared with its post-year counterpart at the same structural distance from the intervention, maintaining within-firm comparability and avoiding cherry-picking of comparison years (Sorescu et al., 2017). Taken together, the four pairs form a systematic set of uniform five-year-interval comparisons covering the full pre-period window. This pairing yields four paired observations (n = 4) for each tested

variable, enabling a within-firm comparison that reduces exposure to time-invariant firm characteristics

It is important to note that the sample size in this study is extremely limited (n = 4 matched pairs), which substantially reduces the statistical power of the tests. As a result, the analysis should be interpreted as exploratory rather than confirmatory. The findings are not intended to establish causal relationships but to provide preliminary insights into potential patterns associated with mobile trading adoption. The very small sample size limits the generalizability and statistical reliability of the findings. Future research should employ higher-frequency data or a larger sample to improve robustness.

Data Sources

Audited accounting data for 2017–2024 are sourced from DSE Plc annual reports and consolidated financial statements. For each year, the study extracts consolidated current assets, current liabilities, total liabilities (current plus non-current), total assets, revenue from contracts with customers (or total revenue, where disclosed), and profit after tax. The 2025 accounting inputs are obtained from a secondary financial-statement database (S&P Global Market Intelligence, accessed via StockAnalysis.com) due to the unavailability of the audited 2025 integrated report at the time of analysis. While this approach allows for continuity of the dataset, it introduces potential limitations in terms of data consistency and reliability relative to DSE's audited statements. Therefore, the 2025 results should be interpreted with caution and validated in future research using the audited integrated report. Market-activity and mobile-trading indicators for 2025 (turnover, MTP turnover, and account statistics) are sourced from the DSE 2025 Market Performance report.

Market valuation is proxied by DSE Plc's year-end market closing share price (TZS per share). Closing prices for 2017–2025 are taken from the company's annual-report disclosures as compiled in the original article dataset. The 2025 closing price is obtained from StockAnalysis.com historical price data and is consistent with the DSE 2025 market-capitalization disclosures and shares outstanding. The 2017 closing price was not located in the provided 2017 annual report; it is therefore inferred from the annual variation series reported by Market Screener together with the audited 2018 closing price. This 2017 price should be validated against DSE official historical price records in any final replication package.

Data Limitations for 2025

The DSE 2025 Market Performance report provides market-structure, turnover, and MTP uptake indicators but is not an audited set of corporate financial statements. Accordingly, the 2025 ratio calculations in this paper use a secondary financial-statement database (S&P Global Market Intelligence, via StockAnalysis.com). These inputs should be replaced with figures from the audited 2025 integrated report once available. In addition, 2025 coincides with new trading rules (e.g., VWAP-based closing prices and revised block-trade rules), so any 2025 valuation and activity effects are best interpreted as reflecting an interaction between mobile access and market microstructure, rather than a clean mobile-only treatment effect.

Variable Definitions and Measurement

Five accounting ratios are computed in line with common ratio-group practice:

Current Ratio (CR) = (Current Assets) / (Current Liabilities)

Return on Assets (ROA) = (Profit After Tax) / (Total Assets)

Debt to Assets Ratio (DAR) = (Total Liabilities) / (Total Assets)

Debt to Equity Ratio (DER) = (Total Liabilities) / (Total Equity)

Total Asset Turnover (TATO) = (Revenue) / (Total Assets)

To summarize, overall ratio performance while retaining the direction of financial health, a composite Financial Performance Index (FP) is constructed as follows. First, each ratio is transformed so that higher values represent better performance: CR, ROA and TATO are retained; DAR and DER are multiplied by -1 to reflect that lower leverage is preferable. Second, the transformed ratios are standardized across the six analyzed years using z-scores. Third, the FP index is computed as the unweighted mean of the five z-scores for each year. This construction follows the logic of combining multiple ratio families into a single performance summary, while avoiding domination by scale differences (Madsen, 2009).

Data Analysis Technique

Because the matched sample is small (n = 4), the analysis emphasizes non-parametric inference. Paired differences are computed as (post - pre) within each matched year. A Shapiro–Wilk normality test is reported solely as a descriptive transparency measure, in keeping with comparative accounting-event study reporting conventions (Sorescu et al., 2017), to document distributional assumptions, recognizing the low power of normality tests in very small samples. It is explicitly acknowledged that with n = 4, the Shapiro–Wilk test cannot reliably detect non-normality due to extremely low power; the test result does not alter the inferential approach. Primary statistical reliance is entirely on the non-parametric Wilcoxon signed-rank test, which requires no normality assumption and is appropriate for the sample size (Wilcoxon, 1945). All tests are two-tailed with a 5% significance threshold (alpha = 0.05). Given the low power inherent in four paired observations, the discussion places emphasis on direction, economic magnitude, and consistency with the firm's revenue model and market structure, alongside p-values.

RESULTS AND DISCUSSION

Given the very small sample size (n = 4 matched pairs), all results in this section must be interpreted as exploratory and indicative rather than confirmatory. The study is designed to document directional patterns and generate hypotheses for future research; it does not claim to establish causal inference or statistically confirmed effects of mobile trading adoption. With n = 4, the Wilcoxon signed-rank test has very low statistical power, and non-rejection of the null hypothesis should be read as "insufficient evidence" rather than "evidence of no effect."

Descriptive results and ratio dynamics (2017-2025)

Table 1. DSE Plc Financial Ratios, Composite Index, and Closing Price (2017-2025)

Year	*Closing price (TZS)*	*CR*	*ROA (%)*	*DAR*	*DER*	*TATO*	*FP_index*
2017	1,120	11.78	23.95	0.129	0.148	0.334	0.442
2018	1,400	13.25	7.90	0.123	0.140	0.209	-0.423
2019	980	15.08	14.45	0.102	0.113	0.261	0.737
2020	880	11.12	16.32	0.123	0.140	0.263	0.008
2021	1,300	8.62	13.71	0.104	0.116	0.194	0.094
2022	1,700	8.11	14.22	0.108	0.121	0.213	0.038
2023	1,800	7.74	16.36	0.108	0.121	0.248	0.221
2024	2,361	5.29	11.91	0.111	0.125	0.218	-0.306
2025	7,150	3.92	14.42	0.147	0.173	0.415	-0.718

Table 1 summarizes the computed ratios and the composite FP index for 2017–2025 (with 2021 shown as a transition year). Two descriptive patterns stand out. First, DSE Plc maintains high liquidity throughout, with current ratios far above 1. However, liquidity declines materially over the longer window: CR falls from a peak of 15.08 in 2019 to 5.29 in 2024 and 3.92 in 2025. This pattern is consistent with a balance sheet that increasingly supports operational expansion and longer-horizon asset allocation, while current liabilities rise in later years.

Second, profitability (ROA) is relatively strong in most years, ranging from 7.90% in 2018 to above 16% in 2020 and 2023, before moderating to 11.91% in 2024 and recovering to 14.42% in 2025. The unusually high 2017 ROA (23.95%) reflects the eighteen-month reporting period and should not be interpreted as directly comparable to subsequent twelve-month years.

Leverage remains low across most of the period, with DAR typically clustered around 0.10–0.13 and DER around 0.11–0.15, consistent with a capital structure dominated by equity and deferred/unearned-revenue liabilities rather than interest-bearing debt. In 2025, leverage rises (DAR = 0.147; DER = 0.173), aligning with the increase in current liabilities reported for FY2025 and reinforcing the interpretation that liquidity and liability structure evolved alongside market expansion.

Asset turnover (TATO) is modest in the core years, reflecting that a large share of assets comprises financial investments whose returns are captured partly as investment income rather than operating revenue. TATO rises sharply in 2025 (0.415), consistent with the FY2025 revenue expansion, but should still be interpreted cautiously as an operational-intensity proxy rather than a comprehensive return metric.

Pre-post descriptive comparison

Table 2. Pre (2017–2020) vs Post (2022–2025)
Descriptive Summary

Metric	*Pre mean*	*Pre median*	*Post mean*	*Post median*	*Difference (post-pre)*
Current Ratio (CR)	12.807	12.515	6.265	6.515	-6.542
ROA (%)	15.653	15.384	14.228	14.320	-1.426
Debt-to-Assets (DAR)	0.119	0.123	0.118	0.109	-0.001
Debt-to-Equity (DER)	0.135	0.140	0.135	0.123	-0.001
Total Asset Turnover (TATO)	0.267	0.262	0.273	0.233	0.007
Financial Performance Index (FP)	0.191	0.225	-0.191	-0.134	-0.382
Closing Price (TZS)	1,095	1,050	3,253	2,080	2,158

Table 2 compares central tendencies for the pre and post periods under the extended window. The average closing share price rises from TZS 1,095.0 in 2017–2020 to TZS 3,252.8 in 2022–2025 (a mean increase of TZS 2,157.8 per share), and the median rises from TZS 1,050.0 to TZS 2,080.5. This larger valuation gap reflects the 2025 re-rating, consistent with the later scaling of mobile participation and improved price discovery.

In contrast, the ratio-based FP index declines from a positive pre-period mean (0.191) to a negative post-period mean (-0.191). Mechanically, the post period combines lower liquidity (CR) and higher leverage in 2025 with only modest changes in profitability, highlighting that valuation improvements need not coincide with broad improvements across conventional accounting ratios.

Normality test (Shapiro-Wilk) for paired differences

Table 3. Shapiro–Wilk Normality Test for
Paired Differences (n = 4)

Variable	*W*	*p-value*	*Decision (alpha=0.05)*
Financial Performance (FP index)	0.915	0.509	Approx. normal (low power)
Share Price (Closing price)	0.752	0.040	Reject normality (low power)

As shown in Table 3, the Shapiro–Wilk statistic does not reject normality for FP-index paired differences ($W = 0.915$; $p = 0.509$). For share-price differences, the test rejects normality ($W = 0.752$; $p = 0.040$). Given $n = 4$, these outcomes should be treated as descriptive only; the primary inference therefore follows the non-parametric Wilcoxon signed-rank decision rule.

Wilcoxon signed-rank test results

Table 4. Wilcoxon Signed-Rank Test Results
(Two-tailed, n = 4)

Variable	*W*	*p-value (2-tailed)*	*Decision (alpha=0.05)*
Financial Performance (FP index)	2.000	0.375	Fail to reject H0
Share Price (Closing price)	0.000	0.125	Fail to reject H0

Financial performance (H1). The Wilcoxon test indicates no statistically significant difference. The results show a consistent directional pattern across matched pairs; however, the lack of statistical significance suggests that the evidence remains inconclusive in the composite FP index between the pre and post periods (W = 2.0; p = 0.375). With four matched pairs, the evidence remains consistent with a scenario where improved access expands market reach but does not translate into an immediate structural break in accounting ratios. At DSE Plc, this is plausible because operating outcomes reflect both fee activity and investment-income dynamics, while cost structures adjust as systems are developed, stabilized, and maintained.

Market valuation (H2). The share price increases in all four matched pairs (2017 vs 2022, 2018 vs 2023, 2019 vs 2024, and 2020 vs 2025), yet the Wilcoxon test remains statistically non-significant at alpha = 0.05 (W = 0.0; p = 0.125). Notably, with n = 4 the smallest attainable two-tailed exact p-value under the Wilcoxon signed-rank test is 0.125, so the result indicates a fully directional post-period re-rating but insufficient sample size to clear conventional significance thresholds. The 2025 closing price (TZS 7,150) dominates the post-period mean and coincides with a sharp expansion in mobile trading participation and turnover.

The extended window reinforces the interpretation that Hisa Kiganjani's impact is realized through gradual scaling and interaction with liquidity conditions rather than as a discrete 2021 accounting break. In 2025, total equity turnover rose to TZS 663.75bn (190.31% above 2024), and the Mobile Trading Platform contributed TZS 106.68bn—equivalent to 47.16% of turnover from "normal" trades excluding block trades—driven by 47,483 MTP investors. Operationally, DSE also onboarded 94,805 new MTP accounts in 2025, bringing total MTP accounts to 139,971. These magnitudes indicate that the platform became economically material after the earlier study window, supporting the paper's gradual-absorption hypothesis. However, 2025 also coincides with trading-rule reforms intended to unlock liquidity and improve price discovery, so the observed 2025 step-up is best read as a joint effect of adoption scale and market design.

Wilcoxon ranks (direction and magnitude)

Table 5a. Ranks for Financial Performance (FP index)

Direction	*N*	*Mean rank*	*Sum of ranks*
Negative ranks (Post < Pre)	3	2.67	8.00
Positive ranks (Post > Pre)	1	2.00	2.00
Ties	0		
Total	4		

Table 5b. Ranks for Share Price (Closing price)

Direction	*N*	*Mean rank*	*Sum of ranks*
Negative ranks (Post < Pre)	0		0.00
Positive ranks (Post > Pre)	4	2.50	10.00
Ties	0		
Total	4		

Tables 5a and 5b clarify the sign and magnitude structure underlying the Wilcoxon tests. For the FP index, three of four paired differences are negative (post < pre), yielding a small positive-rank sum (W = 2.0) and a non-significant two-tailed p-value (0.375). For the share price, all four paired differences are positive (post > pre), producing W = 0.0 and the minimum attainable two-tailed exact p-value under n = 4 (0.125).

To complement the composite index, individual-ratio Wilcoxon tests (Table 6; see also Appendix B for pairwise differences and Appendix D for standardized z-score components) show that year-paired differences are not statistically significant at alpha = 0.05 for CR, ROA, DAR, DER, or TATO. These individual-ratio tests serve as a robustness check on the FP index: they confirm that no single ratio mechanically drives the composite result and that non-significance is consistent across all five ratio dimensions. The three analytical presentations in this study (Wilcoxon signed-rank on the FP index, rank direction and magnitude tables, and individual-ratio Wilcoxon tests) therefore constitute a structured robustness framework, not independent hypothesis tests (Sorescu et al., 2017). Nevertheless, the direction of change is informative: liquidity (CR) declines in all four matched pairs, while activity (TATO) rises in the 2020–2025 pair alongside the FY2025 revenue expansion. Full pairwise differences are in Appendix B (Table B1) and standardized z-score components in Appendix D (Table D1)

The valuation increase, despite mixed accounting ratios, is consistent with a market that re-prices the exchange as the platform reaches scale, trading participation broadens, and market liquidity and transparency improve. In such settings, valuation can respond to growth expectations and market-quality improvements even when contemporaneous ratios do not shift uniformly.

Finally, Tanzania's market structure matters for how quickly digital access translates into observed outcomes. The June 2025 microstructure reforms (including

VWAP-based closing prices and revised price-variation caps) likely interacted with mobile adoption to strengthen price discovery and support higher trading activity, making the 2025 outcomes particularly informative for the "gradual absorption" hypothesis.

Table 6. Individual Ratio Wilcoxon Tests (Two-tailed, n = 4)

Variable	*W*	*p-value (2-tailed)*
Current Ratio (CR)	0.000	0.125
Return on Assets (ROA)	3.000	0.625
Debt-to-Assets (DAR)	5.000	1.000
Debt-to-Equity (DER)	5.000	1.000
Total Asset Turnover (TATO)	5.000	1.000

Robustness and Limitations

Robustness

The primary findings are subjected to three robustness checks to assess whether conclusions hold under alternative analytical conditions.

Robustness Check 1: Multi-layer analytical framework. The study employs three complementary analytical layers: (i) the Wilcoxon signed-rank test on the composite FP index (Table 4); (ii) rank direction and magnitude tables (Tables 5a and 5b); and (iii) individual-ratio Wilcoxon tests (Table 6). These layers form a structured robustness framework, not independent hypothesis tests. The rank direction tables reveal the sign and relative magnitude of each paired difference, which is informative when the composite test is non-significant but directionally consistent. The individual-ratio tests disaggregate the composite result across all five ratio dimensions (CR, ROA, DAR, DER, TATO), confirming non-significance is not driven by any single component of the FP index.

Robustness Check 2: Sensitivity analysis excluding the 2020–2025 pair. Given that the 2025 closing price (TZS 7,150) is a potential outlier and coincides with the June 2025 market microstructure reforms, the primary tests are repeated excluding the 2020–2025 matched pair, retaining n = 3 pairs. Table 7 below reports the results.

Table 7. Sensitivity Analysis: Wilcoxon Signed-Rank Tests Excluding the 2020–2025 Pair (n = 3)

Variable	***W***	***p-value (2-tailed)***	***Direction***
Financial Performance (FP index)	2.000	0.750	2 of 3 pairs: post < pre
Share Price (Closing price)	0.000	0.250	All 3 pairs: post > pre

When the 2020–2025 pair is excluded, the Wilcoxon signed-rank test continues to fail to reject the null hypothesis for both the FP index (W = 2.0; p = 0.750) and the share price (W = 0.0; p = 0.250). Critically, the directional pattern is preserved: the FP index remains predominantly negative in the post-period (two of three pairs), and the share price increases in all three remaining matched pairs (2017–2022: +TZS 580; 2018–2023:

+TZS 400; 2019–2024: +TZS 1,381). This confirms that the directional share price pattern is not solely driven by the 2025 observation, and that non-significance in the FP index reflects a statistical power constraint rather than an artefact of a single extreme data point. As expected, power diminishes further at n = 3, reinforcing the exploratory character of all findings.

Robustness Check 3: FP index component-level stress test. The composite FP index is constructed using standardized z-scores across the eight analyzed years, limiting sensitivity to scale differences across ratio families and allowing the sign of each component's contribution to be inspected directly (Appendix D, Table D1). The individual-ratio Wilcoxon tests (Table 6) confirm non-significance across all five ratio dimensions, with no single ratio driving the composite FP index result.

Summary of robustness findings. The three robustness checks collectively confirm: (i) the non-significant FP index result is not an artefact of any single ratio or the 2025 outlier observation; (ii) the directional share price increase is consistent even after excluding the most potentially reform-confounded pair; and (iii) low statistical power, stemming from n = 4 matched pairs, is the binding constraint on inference rather than the absence of an underlying pattern. These findings reinforce the need for future research with higher-frequency data, larger samples, and multi-firm designs to draw confirmatory conclusions.

Limitations

The analysis carries several material limitations. First, the sample is very small (n = 4 matched pairs), which severely limits statistical power; all results should therefore be treated as exploratory rather than confirmatory. Second, the 2017 baseline is based on an eighteen-month reporting period ended 31 December 2017, which affects comparability for ROA and TATO and inflates the 2017 figures relative to subsequent twelve-month years. Third, FY2025 accounting inputs are sourced from a secondary financial-statement database (S&P Global Market Intelligence via StockAnalysis.com) pending access to the audited 2025 integrated report. This introduces potential inconsistencies in accounting classification and measurement relative to DSE's audited statements, and the 2025 figures should be validated and replaced with audited data in any replication study. This reliance on secondary data is a transparency limitation that must be explicitly acknowledged rather than merely noted as a practical expedient. Fourth, and critically, the 2025 post-period observations coincide with major market microstructure reforms implemented on 2 June 2025 (VWAP-based closing prices, revised price-variation caps, and revised block-trade rules). The 2025 share price surge and turnover expansion therefore reflect a joint effect of mobile trading adoption and regulatory reform, and the specific contribution of Hisa Kiganjani cannot be isolated from these concurrent changes. This confounding is a material limitation that prevents causal attribution of 2025 valuation outcomes to mobile trading alone. Fifth, broader macro-financial conditions and post-election market dynamics may have independently influenced prices during the post-period, further complicating any directional inference. Taken together, these limitations mean the study's findings are best understood as a documented preliminary pattern requiring validation through larger-sample, higher-frequency, and multi-firm research designs.

Future research should use higher-frequency data and incorporate multiple firms, and should explicitly model concurrent market-design changes (e.g., closing-price methodology, price limits, and block-trade rules). Such designs can better isolate the timing of market reactions around rollout and reform milestones and can test whether mobile adoption effects are amplified under improved liquidity and price-discovery regimes.

CONCLUSION

This study examines whether Dar es Salaam Stock Exchange Plc's mobile trading initiative (Hisa Kiganjani) coincided with changes in accounting-based financial performance and market valuation over an extended 2017–2025 window. Using a paired pre–post design, the analysis compares 2017–2020 with 2022–2025, treating 2021 as a transition year excluded from hypothesis testing. Financial performance is measured using five ratios aggregated into a standardized FP index, and market valuation is proxied by the year-end closing share price.

Two main findings emerge. First, the composite FP index does not exhibit a statistically significant pre–post shift (Wilcoxon W = 2.0; p = 0.375). Second, the share price rises in all four matched pairs, indicating a clear directional re-rating, but the increase is not statistically significant at alpha = 0.05 (Wilcoxon W = 0.0; p = 0.125). With n = 4, p = 0.125 is the smallest attainable two-tailed exact p-value under the signed-rank test, so the result should be interpreted as a consistent directional pattern constrained by low statistical power rather than as evidence of no valuation effect.

Substantively, the extended window provides indicative support for the "gradual absorption" interpretation: mobile trading becomes economically material at scale in 2025 (high MTP turnover, investor participation, and account growth) and coincides with market microstructure reforms intended to improve price discovery and liquidity. However, because these developments are concurrent with regulatory changes, this interpretation is exploratory rather than confirmed.

Limitations, this study carries the following limitations that must be prominently acknowledged. (1) Very small sample (n = 4 matched pairs): the study has critically low statistical power; all findings are exploratory and should not be treated as confirmatory evidence of causal mobile-trading effects. (2) Confounding by 2025 microstructure reforms: the major trading-rule reforms of June 2025 (VWAP-based pricing, revised price limits, block-trade rule revisions) occurred simultaneously with the peak of mobile trading adoption, making it impossible to isolate the mobile trading effect from regulatory changes in the 2025 post-period observations. (3) Secondary financial data: FY2025 inputs are from S&P Global Market Intelligence rather than DSE's audited 2025 report, introducing potential measurement inconsistencies. (4) Eighteen-month 2017 baseline: the 2017 reporting period affects ROA and TATO comparability. (5) Macro-financial confounders: broader economic conditions and market sentiment shifts may have influenced share prices independently of mobile trading adoption. These limitations collectively mean that the paper contributes a documented directional pattern and a testable hypothesis framework, rather than causal empirical evidence.

Future research with higher-frequency data, larger samples, and multiple firms is essential to validate these preliminary findings.

Future research should use higher-frequency (monthly or daily) data to increase statistical power, incorporate multiple listed firms to separate firm-specific from market-wide effects, and explicitly model concurrent market-design changes to identify interaction effects between digital access and trading rules. Replication packages should source year-end prices directly from DSE official historical quote records and replace secondary 2025 accounting inputs with the audited 2025 integrated report once available.

APPENDICES

Appendix A: Financial-Statement Inputs Used for Ratio Computation

Table A1 reports the consolidated line items extracted for 2017–2025 that are used for ratio computation. All accounting items are expressed in TZS'000 for consistency with the audited statements. 2017 inputs are taken from the audited eighteen-month financial statements ended 31 December 2017 (with values converted to TZS'000). Inputs for 2018–2024 are drawn from DSE Plc annual reports as compiled in the original article dataset. Transition-year (2021) and post-year (2025) inputs are sourced from S&P Global Market Intelligence (via StockAnalysis.com) pending availability of the audited 2025 integrated report. Closing prices follow the original dataset for 2018–2024, StockAnalysis.com for 2025, and an inferred 2017 year-end price based on the annual-variation series reported by Market Screener.

Table A1. Consolidated statement inputs (TZS'000, except closing price)

Panel A. Balance sheet items (TZS'000)

Year	Current assets (TZS'000)	Current liabilities (TZS'000)	Total liabilities (TZS'000)	Total assets (TZS'000)	Total equity (TZS'000)
2017	18,115,345	1,537,736	2,842,149	21,993,329	19,151,180
2018	18,455,534	1,392,925	2,730,233	22,249,736	19,519,503
2019	21,056,672	1,396,334	2,498,650	24,558,080	22,059,430
2020	24,919,875	2,241,371	3,498,600	28,424,779	24,925,479
2021	15,704,000	1,822,000	3,025,000	29,164,000	26,140,000
2022	18,193,750	2,243,278	3,391,131	31,528,669	28,137,538
2023	20,555,592	2,655,646	3,748,811	34,818,834	31,070,023
2024	15,498,201	2,930,349	3,977,940	35,865,449	31,888,009
2025	20,328,000	5,185,000	6,206,000	42,179,000	35,973,000

Panel B. Income statement and market items (TZS'000 except closing price)

Year	Revenue (TZS'000)	Profit after tax (TZS'000)	Closing price (TZS)
2017	7,354,452	5,266,463	1,120
2018	4,639,823	1,757,688	1,400
2019	6,408,667	3,547,980	980
2020	7,464,358	4,639,045	880
2021	5,672,000	3,997,000	1,300
2022	6,715,558	4,482,653	1,700
2023	8,647,070	5,696,071	1,800
2024	7,806,100	4,272,469	2,361
2025	17,496,000	6,083,000	7,150

Appendix B: Pairwise Differences and Additional Tests

Table B1 provides the paired (post minus pre) differences for each ratio and the closing price. Table B2 reports Wilcoxon signed-rank tests for individual ratios. These are supplementary and are not used to alter the main inferences.

Table B1. Paired differences (post minus pre)

Matched pair	CR diff	ROA diff	DAR diff	DER diff	TATO diff	Price diff (TZS)
2017-2022	-3.6702	-0.0973	-0.0217	-0.0279	-0.1214	580
2018-2023	-5.5091	0.0846	-0.0150	-0.0192	0.0398	400
2019-2024	-9.7911	-0.0253	0.0092	0.0115	-0.0433	1,381
2020-2025	-7.1976	-0.0190	0.0241	0.0322	0.1522	6,270

Table B2. Wilcoxon signed-rank tests for individual ratios (n = 4)

Variable	W	p-value (2-tailed)
Current Ratio (CR)	0.000	0.125
Return on Assets (ROA)	3.000	0.625
Debt-to-Assets (DAR)	5.000	1.000
Debt-to-Equity (DER)	5.000	1.000
Total Asset Turnover (TATO)	5.000	1.000
Closing Price (TZS)	0.000	0.125

Appendix C: Transition-Year (2021) Descriptive Context

Although 2021 is excluded from statistical testing, it represents the implementation window in which DSE reported the registration and formalization of the mobile trading platform brand "*Hisa Kiganjani*", alongside other digital and market-development initiatives. Table C1 summarizes 2021 accounting inputs and derived ratios using the audited 2021 comparatives disclosed in the 2022 financial statements.

Table C1. Transition-year (2021) ratios and closing price
(not included in hypothesis tests)

Year	Closing price (TZS)	CR	ROA (%)	DAR	DER	TATO
2021	1,300	8.62	13.71	0.104	0.116	0.194

The 2021 closing price (TZS 1,300) is also consistent with DSE's narrative disclosure that the share price rose sharply during 2021 from the 2020 year-end level, suggesting that market perception improved around the rollout period even as financial performance remained influenced by trading activity conditions and investment income (DSE PLC, 2021).

Appendix D: Standardised Components of the Composite Performance Index

Table D1 reports the standardized (z-score) components used to build the composite FP index. Following the original article, the index standardizes CR, ROA, and TATO directly, and multiplies DAR and DER by −1 prior to standardization so that higher values consistently indicate stronger performance. Z-scores are computed using the mean and population standard deviation calculated across the eight analyzed years (2017–2020 and 2022–2025). The transition year (2021) is shown for context using the same standardization parameters but is excluded from the statistics that define the z-scores and from hypothesis tests.

Table D1. Z-scores underlying the composite FP index (2017–2025)

Year	CR (z)	ROA (z)	-DAR (z)	-DER (z)	TATO (z)	FP index
2017	0.614	2.117	-0.753	-0.737	0.966	0.442
2018	1.016	-1.655	-0.284	-0.266	-0.923	-0.423
2019	1.517	-0.116	1.223	1.200	-0.136	0.737
2020	0.433	0.324	-0.311	-0.293	-0.112	0.008
2021	-0.251	-0.290	1.080	1.065	-1.134	0.094
2022	-0.390	-0.170	0.805	0.801	-0.856	0.038
2023	-0.491	0.333	0.797	0.793	-0.326	0.221
2024	-1.162	-0.712	0.564	0.568	-0.787	-0.306
2025	-1.536	-0.122	-2.040	-2.066	2.174	-0.718

Appendix E1: *Hisa Kiganjani* / Mobile Trading Platform Activity Indicators

This appendix reports selected non-accounting indicators of Hisa Kiganjani uptake and trading activity. These indicators are used as contextual evidence on the mechanism (participation and turnover), not as additional hypothesis tests.

Table E1. Mobile trading platform activity indicators (selected, 2023–2025)

Indicator	2023	2024	2025	Source note
New MTP accounts onboarded (count)	6,624	27,211	94,805	2024 Sustainability Report (2023–2024); DSE 2025 Market Performance report (2025)
MTP turnover / transaction value (TZS)	1.98 billion	14 billion	TZS 106.68bn	2024 Sustainability Report (2023–2024); DSE 2025 Market Performance report (2025)
MTP investors (count)	—	8,795	47,483	DSE 2025 Market Performance report
Total MTP accounts (count)	—	45,166	139,971	DSE 2025 Market Performance report

Interpretation: Mobile registrations and transaction activity rise sharply between 2023 and 2025, indicating that platform adoption accelerated after institutionalization. Because these indicators are affected by both onboarding scale and market conditions, they are used only as descriptive context.

Table E2: Post-sample market activity and mobile trading uptake indicators (2024–2025)

Indicator	2024	2025
Total equity turnover (TZS bn)	228.63	663.75
MTP turnover (TZS bn)	—	106.68
MTP investors (count)	8,795	47,483
New CDS accounts (count)	29,679	123,547
Total CDS accounts (count)	617,092	740,639
New MTP accounts (count)	27,211	94,805
Total MTP accounts (count)	45,166	139,971
MTP share of normal trades (%)	—	47.16

The table reports post-sample market activity and mobile trading uptake indicators that coincide with the 2025 trading-rule reforms. these figures provide mechanism-consistent context for interpreting the extended post-period valuation and activity outcomes.

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