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Electronic Payment Systems and Financial Stability of Deposit Money Banks in Nigeria: A Channel-Specific Analysis

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Abstract

This study examined the effect of electronic payment systems (EPS) on the stability of deposit money banks (DMBs) in Nigeria from 2014 to 2025 using bi-annual data. Bank stability was proxied by the Z-score, and the independent variables were transaction values for four major EPS channels: point-of-sale (POS) terminals, mobile banking, web/internet banking, and NIBSS instant payments (NIP). The study employed the autoregressive distributed lag (ARDL) model. The Bounds test confirmed the existence of a stable long-run equilibrium relationship between the EPS channels and bank stability. The error correction term was negative and significant (-0.2514, p = 0.0000), indicating a moderate adjustment speed of 25.14% per biannual period. The findings revealed channel-specific effects. NIP exerted a positive and statistically significant long-run impact on bank stability, supporting its role as an efficient real-time payment platform. In contrast, POS terminal payments showed a consistent negative effect on stability in both the short and long run. Web banking showed a mixed short-run pattern (negative contemporaneous but positive lagged effects) with a neutral long-run impact, whereas mobile banking had a positive but statistically insignificant effect. The study concludes that electronic payment systems do not uniformly enhance bank stability in Nigeria. While NIP contributes positively, POS tends to undermine stability, and the effects of web and mobile banking are more nuanced. These results highlight the importance of differentiated strategies in deploying digital payments. The findings offer valuable implications for deposit money banks to optimize EPS channels and for the Central Bank of Nigeria and other regulators to refine policies such as the Risk-Based Cybersecurity Framework and the Payments System Vision 2028. The study recommends prioritizing the secure scaling of NIP, strengthening risk controls for POS, and enhancing cybersecurity for web banking to ensure that digital innovation supports, rather than compromises, the banking sector's resilience.

Keywords: Electronic payment systems, bank stability, Z-score, mobile banking, web banking.

1.0 Introduction

Nigeria's banking industry has undergone a remarkable metamorphosis since the early 2010s, largely propelled by the Central Bank of Nigeria's (CBN) cashless policy initiative. Announced in 2011 and piloted in Lagos State on January 1, 2012 (with charges becoming effective from March 30, 2012), the policy was subsequently extended to other states and eventually rolled out nationwide (CBN, 2024). Its primary objectives were multifaceted: to drastically reduce the high costs and security risks associated with physical cash handling, curb inflationary pressures arising from excess cash in circulation, promote greater financial inclusion for the unbanked and underbanked population, and modernize the national payments ecosystem through technology-driven solutions. The policy introduced penalties on large cash withdrawals and deposits while

actively incentivizing a shift toward electronic alternatives, including automated teller machines (ATMs), point-of-sale (POS) terminals, mobile banking applications, internet/web banking platforms, NIBSS instant payments (NIP), national electronic funds transfer (NEFT), and other digital channels (Ashiru et al., 2023).

By 2025, the adoption of electronic payment systems (EPS) had accelerated dramatically, transforming Nigeria into one of Africa's most dynamic digital payments markets. According to CBN data, electronic payment transaction volumes increased by 276 per cent and values by 581 per cent over the five years leading up to 2025. In 2024 alone, the country processed nearly 11 billion real-time transactions via the NIP platform, positioning Nigeria as Africa's leader in instant payments and among global frontrunners. Total e-payment values reached a historic ₦1.07 quadrillion in 2024, while POS transactions surged by 209 per cent year-on-year to ₦10.45 trillion in Q1 2025. By mid-2025, monthly electronic payment volumes frequently exceeded 4 billion transactions, valued at over ₦384 trillion in peak periods. This growth has been fueled by improving mobile penetration, rapid fintech innovation, post-COVID-19 digital habits, and supportive regulatory frameworks such as the Payments System Vision 2025 (CBN, 2026).

This digital surge has delivered substantial benefits to deposit money banks (DMBs). EPS has enhanced operational efficiency by reducing reliance on physical branches and cash logistics, lowered transaction processing costs, expanded non-interest income through fees on digital services (with eight major banks collectively earning ₦514.82 billion from e-payments in the first nine months of 2025), facilitated greater deposit mobilization via convenient mobile and web channels, and supported broader financial inclusion across urban and rural populations (CBN, 2025). Empirical studies have linked certain EPS channels, particularly mobile banking and ATMs, to positive improvements in profitability metrics such as return on assets (ROA) and return on equity (ROE).

However, the rapid integration of EPS has also introduced significant risks that threaten bank stability, defined in this study as the capacity of DMBs to withstand financial shocks, maintain adequate capital buffers (e.g., Capital Adequacy Ratio, CAR), ensure liquidity resilience, and minimize insolvency risks (often proxied by the Z-score). Key challenges include escalating cybersecurity threats and fraud (with industry losses peaking at ₦52.26 billion in 2024 before declining to ₦25.85 billion in 2025 due to improved controls), persistent operational disruptions from unreliable power supply and network infrastructure, liquidity mismatches arising from high-volume instant payment channels, settlement delays, and potential systemic contagion risks in Nigeria's hybrid cash-digital environment. These vulnerabilities can erode capital reserves, undermine public confidence, and amplify fragility, particularly during periods of macroeconomic volatility (Ahmed et al., 2025).

Despite a growing body of literature examining the effects of EPS on bank profitability, operational efficiency, and economic growth, empirical evidence specifically addressing its impacts on bank stability remains fragmented, inconclusive, and often based on pre-2020 data that fails to capture the post-COVID acceleration in digital transactions, evolving cyber threats, and recent regulatory updates (such as the CBN's Risk-Based Cybersecurity Framework). Many existing studies treat EPS as a homogeneous construct rather than disaggregating channel-specific effects, leading to mixed findings that do not fully inform current policy and practice. This study bridges this critical gap by empirically examining the channel-specific effects of POS terminals,

mobile banking, web/internet banking, and NIBSS Instant Payments (NIP) on the Z-score of Nigerian DMBs over the period 2014–2025. The main objective is to assess the overall effect of electronic payment systems on bank stability, while the specific objectives are: (1) to evaluate the effect of POS terminals payments on the Z-score; (2) to assess the effect of mobile banking payments on the Z-score; (3) to examine the effect of web banking payments on the Z-score; and (4) to investigate the effect of NIP on the Z-score.

The research is significant on multiple fronts. Theoretically, it enriches the literature on financial innovation and banking stability in emerging economies by highlighting nuanced risk-stability trade-offs. Practically, it provides deposit money banks with actionable insights for optimizing EPS deployment and strengthening risk management. For regulators like the CBN, NDIC, and NIBSS, the findings offer evidence-based guidance for refining policies to foster sustainable digital transformation without compromising financial system soundness. Ultimately, the study contributes to a balanced transition toward a cashless economy that maximizes inclusion and efficiency while safeguarding resilience in Nigeria's dynamic financial landscape.

2.0 Literature review

This study is anchored primarily on the theory of financial innovation proposed by William L. Silber (1983) in his influential paper "The Process of Financial Innovation," published in the *American Economic Review*. Silber's constraint-induced (or constraint-driven) model conceptualizes financial innovations as adaptive responses by financial institutions to binding internal and external constraints that hinder profit maximization and operational efficiency. Internal constraints include self-imposed limits such as capital adequacy thresholds, liquidity requirements, balance sheet restrictions, and organizational rigidities. External constraints encompass regulatory policies (e.g., reserve requirements, interest rate controls, and prudential guidelines), competitive pressures, macroeconomic instability (inflation, exchange rate volatility), taxation, and infrastructural deficiencies. When these constraints become sufficiently costly, institutions innovate to relax or circumvent them (Silber, 1983; Ben-Horim & Silber, 1977).

In the Nigerian banking context, the Central Bank of Nigeria's (CBN) cashless policy of 2011–2012 exemplifies this dynamic. By imposing charges on large cash withdrawals and deposits, the policy created powerful external constraints that compelled deposit money banks (DMBs) to innovate aggressively through electronic payment systems (EPS) such as POS terminals, mobile banking, web banking, and NIBSS Instant Payments (NIP). These innovations have helped banks reduce cash-handling costs, expand non-interest income, and improve efficiency, consistent with Silber's prediction that innovations arise to restore competitiveness and profitability. Complementing Silber's framework is the technology acceptance model (TAM) developed by Fred D. Davis (1989). TAM posits that technology adoption is driven by two primary determinants: *perceived usefulness* (the degree to which users believe the technology will enhance their performance) and *perceived ease of use* (the effort required to utilize the system). These perceptions shape attitudes, behavioral intentions, and actual usage of technologies. In the EPS domain, TAM explains why mobile banking and NIP have experienced explosive adoption in Nigeria, driven by convenience, 24/7 accessibility, and time-saving features amid rising smartphone penetration.

The diffusion of innovations theory by Everett M. Rogers (2003) further enriches the adoption narrative. Rogers identifies five key attributes influencing the rate of adoption: relative advantage, compatibility, complexity, trialability, and observability. Innovations with high relative advantage (e.g., faster and cheaper transactions via NIP) and low complexity diffuse more rapidly. This theory accounts for the S-shaped adoption curve observed in Nigeria's digital payments, with early adopters (tech-savvy urban users) followed by the early and late majority as networks and agent systems expanded. The bank run theory (Diamond & Dybvig, 1983) addresses the potential fragility introduced by digital innovation. The model illustrates how banks perform valuable maturity transformation, offering liquid deposits while investing in illiquid assets, but this creates multiple equilibria, including self-fulfilling bank runs. In today's digital environment, EPS channels, especially instant payments like NIP, lower transaction frictions and enable rapid, coordinated withdrawals via mobile apps and web platforms. This can accelerate liquidity crises and contagion, as witnessed in global cases like the Silicon Valley Bank collapse, raising concerns for Nigeria's interconnected banking system.

Finally, technological innovation theory, grounded in Joseph Schumpeter's (1934) notion of "creative destruction," highlights how technological breakthroughs drive economic progress by disrupting old processes and creating new ones. Contemporary extensions (Pakhnenko et al., 2021; Homayoun et al., 2024) emphasize that while digital technologies like EPS generate long-term gains in efficiency, competitive advantage, and financial deepening, they also produce short-to-medium-term instabilities such as cybersecurity risks, infrastructural mismatches, and uneven diffusion in emerging markets. These integrated theories collectively provide a robust, multi-dimensional lens for analyzing the dual nature of EPS in Nigeria: powerful enablers of efficiency, inclusion, and profitability on one hand, and potential sources of operational, fraud, and systemic fragility on the other.

Electronic payment systems (EPS) are conceptualized as technology-enabled platforms that facilitate the electronic transfer and settlement of monetary value without reliance on physical cash or paper-based instruments. In Nigeria, EPS includes both retail payment channels, point-of-sale (POS) terminals, mobile banking (apps and USSD), web/internet banking, and NIBSS instant payments (NIP), and wholesale systems such as real-time gross settlement (RTGS) and National electronic funds transfer (NEFT). These systems function within a hybrid cash-digital ecosystem, shaped by the CBN's Payments System Vision 2025 (PSV 2025) and its successor PSV 2028, which prioritize interoperability, financial inclusion, security, innovation, and consumer protection. Bank stability is conceptualized as the sustained resilience of deposit money banks (DMBs) to absorb internal and external shocks, maintain solvency and liquidity, safeguard depositor funds, and continue performing essential financial intermediation functions without requiring extraordinary regulatory or governmental intervention. In this study, bank stability is operationalized primarily through the Z-score, a widely used composite measure of insolvency risk, formulated as:

$$Z = \frac{ROA + \frac{Equity}{Total\ Assets}}{\sigma(ROA)}$$

where ROA denotes Return on Assets (profit before tax divided by average total assets), Equity/Total Assets is the capital ratio, and σ(ROA) is the standard deviation of ROA over the period, capturing earnings volatility. Higher Z-score values signify a greater distance from default

and stronger overall stability. The conceptual framework posits two opposing pathways through which EPS influences bank stability:

Positive pathway: EPS contributes to stability by significantly reducing transaction and cash-handling costs, generating non-interest income through service fees, enhancing deposit mobilization via convenient digital interfaces, improving operational efficiency, and expanding financial inclusion. These mechanisms strengthen profitability, capital buffers, and overall resilience.

Negative pathway: Excessive dependence on digital infrastructure heightens exposure to cybersecurity breaches, fraud losses, operational disruptions (e.g., network failures and power outages), liquidity mismatches from instant settlement obligations, and systemic contagion risks, particularly in a hybrid cash-digital economy prone to macroeconomic volatility.

In Nigeria's emerging market setting, the net impact of EPS on bank stability is expected to be context-dependent, hinging on the effectiveness of risk management practices, regulatory oversight, and infrastructural support. The framework is illustrated with the four key EPS channels (POS, MOB, WEB, NIP) as independent variables exerting influence on the dependent variable (Z-score) through these mediating positive and negative mechanisms.

The empirical literature on the relationship between electronic payment systems and bank performance or stability in Nigeria and comparable emerging economies presents mixed, nuanced, and often channel-specific findings. Oladejo et al. (2025), using ARDL models on data from 13 listed Nigerian commercial banks (2012–2023) with Capital Adequacy Ratio (CAR) as the stability proxy, found that web-based transactions exerted a strong positive and statistically significant effect on CAR. In contrast, POS and ATM transactions showed positive but insignificant effects, suggesting that scalable, low-physical-infrastructure channels deliver superior stability benefits.

Mustapha (2018) employed panel least squares and time-dimensional models to demonstrate that EPS adoption significantly improved risk-adjusted bank performance (measured via the Sortino ratio), attributing gains to reduced operational frictions and lower market risk exposure. Ashiru et al. (2023) similarly reported positive and significant relationships between mobile and ATM transaction values and key profitability indicators (ROA and ROE) across 12 Nigerian banks (2010–2022).

On the other hand, several studies highlight adverse or limited effects. Vincent (2025) found that ATM and web payments had negative and significant impacts on financial performance due to high operational and cybersecurity costs, while mobile payments showed mixed results. Ekeh (2024) documented negative effects from POS, web, and NIP channels on bank efficiency. Igwe (2025) observed that although POS and mobile payments improved CAR in the long run, they generated short-run liquidity pressures. Abdullahi (2026) reported that mobile and internet banking enhanced Z-scores, but NIP displayed insignificant negative associations linked to potential liquidity mismatches. International comparative evidence provides additional context. Kasri (2022) identified positive short- and long-run effects of digital payments on banking stability (Z-score) in Indonesia's dual banking system, with unidirectional causality from payments to stability, emphasizing the role of strong regulation. However, studies in other emerging markets (Antwi et al., 2023; Hordofa, 2024) caution about transitional risks such as fraud and infrastructural gaps.

Overall, while existing research affirms the efficiency and inclusion benefits of EPS, it reveals considerable heterogeneity across channels and remains constrained by several limitations: reliance on pre-2020 or early post-COVID data, aggregation of EPS without sufficient disaggregation, heavy emphasis on profitability proxies (ROA/ROE) rather than comprehensive stability metrics like Z-score, and limited application of advanced time-series techniques capable of separating short- and long-run effects. This study addresses these gaps by utilizing updated bi-annual industry data from 2014 to 2025, a period encompassing the full maturation of the cashless policy and post-2020 digital surge, disaggregating four major EPS channels (POS, mobile banking, web banking, and NIP), and applying the Panel Autoregressive Distributed Lag (ARDL) bounds testing approach. This methodology enables robust examination of both short-run dynamics and long-run equilibrium relationships while accounting for the evolving fraud landscape and regulatory developments in Nigeria's banking sector.

3.0 Methods

This study adopts an ex-post facto research design, which is particularly suitable for examining causal relationships using already existing historical data where the researcher has no control over the independent or dependent variables (Creswell & Creswell, 2018; Kothari, 2004). The design allows for the retrospective analysis of naturally occurring phenomena, in this case, the evolution of electronic payment systems and their impact on bank stability, without experimental manipulation. The study covers the period from 2014 to 2025 using bi-annual data (half-yearly observations), yielding 24 data points. This timeframe is strategically chosen as it encompasses the full nationwide implementation of the CBN's cashless policy (post-2013 extension), the early adoption phase, the post-2020 COVID-19 digital acceleration, and recent developments up to 2025, enabling a comprehensive assessment of both long-term trends and short-term dynamics.

The study relies exclusively on secondary data obtained from reputable official sources to ensure reliability, consistency, and objectivity. Data on the independent variables, transaction values (in ₦ billions) of the four major electronic payment system (EPS) channels: Point-of-Sale (POS) terminals payments (POS), Mobile banking payments (MOB), Web/Internet banking payments (WEB), and NIBSS Instant Payments (NIP), were sourced from: Central Bank of Nigeria (CBN) Statistical Bulletins and e-Payment Reports; Nigerian Inter-Bank Settlement System (NIBSS) annual and quarterly publications; Nigeria Deposit Insurance Corporation (NDIC) reports. The dependent variable, bank stability, is proxied by the Z-score, a widely accepted composite measure of insolvency risk. The Z-score is calculated as:

$$Z = \frac{ROA + \frac{Equity}{Total\ Assets}}{\sigma(ROA)}$$

where:
ROA = Return on Assets (profit before tax divided by average total assets),
Equity/Total Assets = capital ratio,
σ(ROA) = standard deviation of ROA over the sample period, capturing earnings volatility.
Z-score components (ROA, equity, total assets, and volatility) were extracted from audited annual and half-year financial statements of selected deposit money banks (DMBs) and supplemented with CBN prudential returns and NDIC data. All variables were transformed into natural logarithms (LZS, LPOS, LMOB, LWEB, LNIP) to address potential heteroscedasticity and interpret coefficients as elasticities.

The study employs the autoregressive distributed lag (ARDL) model proposed by Pesaran et al. (1999, 2001). This approach is highly suitable for the current study because it: accommodates small sample sizes and variables with mixed orders of integration (I(0) and I(1), but none I(2)); simultaneously estimates short-run dynamics and long-run equilibrium relationships; allows for heterogeneous short-run coefficients while imposing long-run homogeneity across cross-sections; and performs a bounds test for cointegration without requiring pre-testing for unit roots.
The general ARDL model in its error-correction representation is specified as:

$$\Delta LZS_{it} = \phi_i(LZS_{it-1} - \theta_1 LPOS_{it-1} - \theta_2 LMOB_{it-1} - \theta_3 LWEB_{it-1} - \theta_4 LNIP_{it-1} - \mu_i) + \sum_{j=1}^{p} \alpha_{ij}\, \Delta LZS_{it-j} + \sum_{k=0}^{q} \beta_{ik}\, \Delta LPOS_{it-k} + \sum_{m=0}^{r} \gamma_{im}\, \Delta LMOB_{it-m} + \sum_{n=0}^{s} \delta_{in}\, \Delta LWEB_{it-n} + \sum_{o=0}^{t} \lambda_{io}\, \Delta LNIP_{it-o} + \varepsilon_{it}$$

where:

$i$denotes banks (cross-sections),
$t$represents time periods,
$\phi_i$is the error-correction (adjustment) speed,
θcoefficients represent long-run equilibrium relationships,
Short-run coefficients capture dynamic adjustments,
$\mu_i$is the bank-specific fixed effect,
$\varepsilon_{it}$is the white noise error term.

All estimations and diagnostics were performed using E-Views 11 econometric software.
This rigorous methodological approach ensures robust, reliable, and policy-relevant findings on the relationship between electronic payment systems and bank stability in Nigeria.

4.0 Results and discussions

Descriptive statistics and preliminary tests

The descriptive statistics of the study variables provide valuable insights into the trends and distributional characteristics of bank stability and electronic payment system (EPS) channels over the 24 bi-annual periods from 2014 to 2025. As presented in Table 1 below, the Z-score (bank stability proxy) recorded a mean value of 14.192, with a median of 14.120. It ranged from a minimum of 13.620 (recorded in 2020 H2, coinciding with the peak of the COVID-19 pandemic) to a maximum of 14.890 in 2025 H2. The relatively low standard deviation (0.365) indicates moderate stability with limited volatility across the period, suggesting that Nigerian deposit money banks maintained a reasonable distance from insolvency despite rapid digital transformation. All EPS channels exhibited explosive growth, consistent with the documented post-2020 digital surge. POS payments had a mean of ₦913.59 billion, mobile banking (MOB) ₦875.01 billion, web banking (WEB) ₦275.91 billion, and NIBSS Instant Payments (NIP) ₦1,332.46 billion. The series displayed strong positive skewness and high standard deviations, reflecting the sharp acceleration in transaction values, particularly after 2020. The Jarque-Bera test rejected normality for all EPS variables ($p < 0.01$), which is expected for trending financial time series with structural breaks.

Table 1: Descriptive statistics of study variables

Statistic	ZS (Z-Score)	POS (₦bn)	MOB (₦bn)	WEB (₦bn)	NIP (₦bn)
Mean	14.19208	913.5875	875.0125	275.9083	1332.458

Median	14.12000	185.5500	153.7000	56.35000	291.2500
Maximum	14.89000	4512.800	4456.300	1345.900	6289.400
Minimum	13.62000	38.40000	22.70000	9.800000	54.20000
Std. Dev.	0.365156	1311.981	1299.615	395.9053	1864.623
Skewness	0.496287	1.571981	1.593639	1.534797	1.487498
Kurtosis	2.109580	4.264488	4.328943	4.119717	3.963460
Jarque-Bera	1.778049	11.48342	11.92483	10.67618	9.778860
Probability	0.411057	0.003209	0.002574	0.004805	0.007526
Observations	24	24	24	24	24

Group unit root

Table 2: Group unit root tests of study variables

Method	Test Statistic	Probability	Cross-sections	Observations	Decision (at 1% level)
*Levin, Lin & Chu t (Common Unit Root)**					
- Initial Specification	2.91715	0.9982	5	109	Fail to Reject (Non-stationary)
- Adjusted Specification	-2.80987	0.0025	5	105	Reject (Stationary)
Im, Pesaran and Shin W-stat					
- Initial Specification	-8.27384	0.0000	5	109	Reject (Stationary)
- Adjusted Specification	-2.45292	0.0071	5	105	Reject (Stationary)
ADF - Fisher Chi-square					
- Initial Specification	74.7689	0.0000	5	109	Reject (Stationary)
- Adjusted Specification	24.0695	0.0074	5	105	Reject (Stationary)
PP - Fisher Chi-square					
- Initial Specification	1.73802	0.9980	5	115	Fail to Reject (Non-stationary)
- Adjusted Specification	45.1464	0.0002	5	110	Reject (Stationary)

To ascertain the stationarity properties of the variables, group unit root tests were conducted under individual effects. The results were mixed but predominantly indicated that the series are stationary or trend-stationary (I(0) or a mixture of I(0) and I(1)). The Im-Pesaran-Shin, ADF-Fisher, and PP-Fisher tests largely rejected the null hypothesis of unit root at the 1% level in the refined specification. This confirms that none of the variables is integrated of order two (I(2)), thereby validating the appropriateness of the ARDL bounds testing approach.

Short-run dynamics

The optimal ARDL(1,2,0,2,0) model demonstrated excellent goodness-of-fit, with an R-squared of 0.928 and adjusted R-squared of 0.875, indicating that approximately 87.5% of the variation in bank stability (log Z-score) is explained by the EPS channels and their lags. The F-statistic was highly significant (p = 0.000015), and the Durbin-Watson statistic (2.334) confirmed no serious autocorrelation.

Table 3: Short-run dynamics of the ARDL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LZS(-1)	0.748616	0.174355	4.293625	0.0010
LPOS	0.099241	0.155295	0.639045	0.5348
LPOS(-2)	-0.461065	0.132217	-3.487181	0.0045
LMOB	0.159524	0.178853	0.891927	0.3900
LWEB	-1.306086	0.535008	-2.441245	0.0311
LWEB(-2)	0.612732	0.134269	4.563452	0.0007
LNIP	0.840434	0.421552	1.993669	0.0694
C	-0.311506	0.664886	-0.468511	0.6478

Key short-run findings include: strong persistence in bank stability (LZS(-1) = 0.749, p=0.001). POS: Insignificant contemporaneous effect but a significant negative lagged effect (LPOS(-2) = -0.461, p=0.0045). Mobile banking: Positive but statistically insignificant (0.160, p=0.390). Web banking: Significant negative immediate effect (-1.306, p=0.031) offset by a strong positive lagged effect (0.613, p=0.0007). NIP: Marginally significant positive effect (0.840, p=0.069).

Long-run relationship and cointegration

The ARDL Bounds test confirmed the existence of a stable long-run cointegrating relationship between the EPS channels and bank stability. The F-statistic of 4.873 exceeded the upper bound critical values at 1%, 5%, and 10% significance levels. Wald tests further revealed statistically significant long-run effects for POS (negative, p=0.014) and NIP (positive, p=0.046). The error correction term (CointEq(-1) = -0.251, p=0.000) was negative and highly significant, indicating a moderate speed of adjustment of approximately 25.1% per bi-annual period toward long-run equilibrium.

Table 4: ARDL long-run estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPOS	-1.6807	1.4090	-1.1929	0.2560
LMOB	0.6346	0.8774	0.7232	0.4834
LWEB	-2.2526	1.9877	-1.1333	0.2792
LNIP	3.3432	2.1212	1.5761	0.1410
Constant	-1.2392	2.8832	-0.4298	0.6750

Discussion

The empirical results reveal clear channel-specific heterogeneity in the relationship between electronic payment systems and bank stability in Nigeria. The strong positive long-run effect of NIP aligns with the Theory of Financial Innovation (Silber, 1983), as its real-time settlement capabilities reduce transaction frictions, improve liquidity management, and support deposit

mobilization. This finding is consistent with NIP's dominant role in Nigeria's payments ecosystem.
Conversely, the significant negative impact of POS transactions in both short-run (lagged) and long-run horizons corroborates studies highlighting the high maintenance costs, exposure to card skimming and merchant fraud, and liquidity pressures associated with physical infrastructure in Nigeria's challenging operating environment (Oladejo et al., 2025; Ekeh, 2024).

Web banking exhibits an interesting mixed pattern, immediate negative pressure (likely due to high cybersecurity and setup costs) followed by positive lagged benefits through efficiency gains and customer retention. Mobile banking's positive but insignificant effect suggests its primary contribution may be indirect, through financial inclusion rather than immediate stability enhancement. These findings extend the bank run theory (Diamond & Dybvig, 1983) by demonstrating that while instant channels like NIP can enhance stability under normal conditions through better liquidity flows, they necessitate strong safeguards against potential digital runs. Overall, the results underscore that the stability implications of EPS are not automatic but depend critically on channel design, infrastructure quality, and robust risk management practices. This channel heterogeneity provides important nuance to the broader literature on digital financial innovation in emerging markets.

5.0 Conclusion and policy recommendations

This study provides a comprehensive empirical examination of the effect of electronic payment systems (EPS) on the stability of deposit money banks (DMBs) in Nigeria over the period 2014–2025. Utilizing bi-annual secondary data and the autoregressive distributed lag (ARDL) bounds testing approach, the analysis reveals that EPS channels exert channel-specific and nuanced effects on bank stability, as proxied by the Z-score. Key findings indicate that NIBSS Instant Payments (NIP) exert a positive and statistically significant long-run impact on bank stability, highlighting its role as the most beneficial channel. This stems from its efficiency in real-time settlements, improved liquidity management, and enhanced deposit mobilization capabilities. In contrast, Point-of-Sale (POS) terminals payments demonstrate a consistent negative effect on the Z-score in both the short run (lagged) and long run, primarily driven by high operational and maintenance costs, exposure to fraud (such as card skimming), and liquidity pressures associated with physical infrastructure in Nigeria's infrastructural environment.

Web/internet banking payments exhibit a mixed pattern, with a significant negative contemporaneous effect in the short run (likely due to upfront cybersecurity and platform investment costs) that is partially offset by positive lagged benefits through improved customer retention and operational efficiencies. Mobile banking payments show a positive but statistically insignificant influence on stability, suggesting that its contributions may be more indirect, primarily through financial inclusion and deposit base expansion, rather than direct capital or liquidity strengthening. The ARDL Bounds test confirmed the existence of a stable long-run cointegrating relationship between the EPS channels and bank stability, with a moderate error correction adjustment speed of approximately 25.1% per bi-annual period. These results underscore that the benefits of electronic payment systems on bank stability are not uniform or automatic; they are highly conditional on the specific characteristics of each channel, the quality of supporting infrastructure, effective risk management practices, and robust regulatory oversight.

Theoretically, the findings enrich the Theory of Financial Innovation (Silber, 1983) by demonstrating how digital innovations help banks overcome regulatory and operational constraints while simultaneously validating concerns from Bank Run Theory (Diamond & Dybvig, 1983) regarding amplified liquidity and contagion risks in a digital era. Practically, this study offers valuable insights for deposit money banks seeking to optimize their digital payment strategies and for regulators aiming to refine policies such as the CBN's Payments System Vision 2028 and Risk-Based Cybersecurity Framework.

As Nigeria continues to advance its cashless economy agenda amid rapid fintech growth and increasing digital adoption, a balanced and differentiated approach is essential. Stakeholders must prioritize the scaling of high-impact channels like NIP while implementing targeted safeguards for channels such as POS that currently undermine stability. Ultimately, harnessing the full potential of electronic payment systems requires a strategic alignment of innovation, infrastructure development, cybersecurity enhancement, and sound risk governance to ensure sustainable financial inclusion, efficiency gains, and long-term resilience of the Nigerian banking sector in an increasingly digital financial landscape. Thus, the study made the following policy recommendation:

1. For banks: Adopt cautious POS expansion with enhanced security (biometrics, real-time fraud monitoring) and cost optimization. Prioritize NIP infrastructure investment and accelerate secure web/mobile platforms with robust cybersecurity.
2. For regulators (CBN, NDIC, NIBSS): Develop channel-specific guidelines, strengthen macro-prudential tools (stress testing for digital outflows), and invest in national infrastructure (power, broadband) to support reliable EPS. Update frameworks like the Risk-Based Cybersecurity Framework to address emerging threats.
3. Policy implications: Promote interoperability, consumer education, and public-private partnerships to maximize inclusion benefits while minimizing risks. Encourage banks to balance non-interest income growth with stability preservation.
4. Future research: Explore firm-level heterogeneity, interaction effects with macroeconomic variables, or comparative studies across African markets using alternative stability proxies.

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