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Effect of Financial technology on the Performance of Deposit Money Banks in Nigeria: An Autoregressive Distributed Lag (ARDL) Approach

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Abstract

This study examines the effect of financial technology (FinTech) on the performance of Deposit Money Banks (DMBs) in Nigeria over the period 2012Q1–2023Q4. Quarterly industry-level data from 2012 to 2023 were sourced from the Central Bank of Nigeria (CBN), Nigeria Inter-Bank Settlement System (NIBSS), and the Nigerian Deposit Insurance Corporation (NDIC) and analysed using the Autoregressive Distributed Lag (ARDL) model. The results showed that POS and internet banking transactions exert significant negative effects on performance in both the short and long run, while mobile banking and ATM transactions have insignificant effects on performance. The study concludes that FinTech adoption in Nigeria has yet to deliver consistent performance gains, with some channels undermining rather than enhancing bank outcomes. It recommends that banks and regulators strengthen their fintech channels and promote interoperability and consumer protection to ensure that digital transformation translates into sustainable improvements in banking performance.

Keywords: *Financial Technology, Bank Performance, CAMELS Framework, Autoregressive Distributed Lag (ARDL) Model, Deposit Money Banks, Nigeria, Performance Index, Digital Banking.*

1. Introduction

The performance of deposit money banks (DMBs) is a fundamental determinant of macroeconomic stability, financial sector soundness, and inclusive economic development, especially in emerging markets. By serving as intermediaries between savers and borrowers, banks facilitate capital allocation, stimulate productive investments, support enterprise growth, and enable the efficient functioning of the payment system (Alam et al., 2021; Puatwoe & Piabuo, 2017).

In Nigeria, DMBs are not only central to resource mobilisation and intermediation but also critical to achieving financial inclusion, supporting micro, small and medium enterprises (MSMEs), and catalysing economic diversification. Their performance is thus a key policy and strategic concern for financial sector stakeholders (Chukwuekwu, 2024).

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Over the past decade, the Nigerian banking sector has recorded substantial growth in key performance indicators. Total bank assets rose from ₦24.32 trillion in 2014 to ₦53.17 trillion in 2022, while profitability, asset quality, and liquidity ratios have consistently improved, despite recurring macroeconomic shocks (NDIC, 2023; CBN, 2023). Nonetheless, the sector remains constrained by operational inefficiencies, high-cost structures, limited financial access in rural regions, infrastructure deficits, and the rising burden of regulatory compliance (Ogbonna et al., 2023; Ola-Oluwa, 2024; Uchenna et al., 2024). Moreover, the rapidly evolving landscape of financial technology (FinTech) has introduced both existential threats and unprecedented opportunities for DMBs.

FinTech, broadly defined as the application of technology to financial service delivery, is fundamentally reshaping banking operations through innovations such as mobile banking, internet banking, automated teller machines (ATMs), and point-of-sale (POS) technologies (Ele et al., 2024; Micu & Micu, 2016). These tools promise to reduce costs, expand access, improve customer experience, and enable service differentiation. FinTech applications are particularly transformative in developing contexts like Nigeria, where financial inclusion gaps and service delivery inefficiencies are pronounced (Chukwuekwu & Ezeaku, 2022). In response to these shifts, many Nigerian banks have invested heavily in digital infrastructure and platforms, leading to increased adoption of mobile apps, USSD channels, internet banking portals, card-based payments, and agency banking models (Ekpo et al., 2023; Olaniyi, 2024).

Despite widespread adoption, the performance implications of FinTech remain poorly understood. While FinTech is theoretically associated with efficiency, real-time transactions, and customer convenience, empirical evidence is mixed: some studies report gains in profitability and efficiency (Oppusunggu et al., 2024; Zhao et al., 2024), whereas others highlight heightened risk exposure, cybersecurity threats, and diminishing returns from high costs and service cannibalisation (Tang et al., 2024; Vu et al., 2024). Most existing research centres on developed economies with mature digital ecosystems (Arenas et al., 2024; Karangara, 2023), while Nigerian studies often rely on cross-sectional or annual data, overlooking the dynamic nature of FinTech adoption and its short- and long-term effects (Adesoye et al., 2024; John et al., 2024; Mgbada et al., 2024). Furthermore,

many use narrow performance proxies such as ROA or net profit, failing to capture the multidimensional character of banking performance in the digital era.

Against this backdrop, this study proposes a more holistic, robust, and context-sensitive approach to examining the effect of financial technology on the performance of Deposit Money Banks in Nigeria. Specifically, this study investigates the effect of financial technology proxied by Mobile Banking, Internet Banking, Automated Teller Machines, and Point-of-Sale on the performance of deposit money banks measured using a multidimensional Performance Index (PI), grounded in the CAMELS framework. The study will adopt the Autoregressive Distributed Lag (ARDL) technique to examine both short-run dynamics and long-run relationships, using quarterly time series data spanning 2012 to 2023.

This study addresses critical gaps in existing research by providing a longitudinal, multidimensional, and empirically rigorous analysis of FinTech's impact on bank performance in Nigeria. It offers evidence-based insights to guide executives, regulators, and policymakers on investment, strategic alignment, and regulatory harmonisation. More broadly, it contributes to the literature on digital transformation in emerging markets and provides a platform for future research on technology-driven financial development in Sub-Saharan Africa.

Research Problem

The Nigerian banking sector has invested heavily in fintech such as mobile banking, internet banking, ATM services, and POS technologies, yet the performance effects of these innovations remain ambiguous. Persistent service disruptions, transaction failures, cyber-fraud, and customer dissatisfaction raise doubts about whether fintech adoption has improved operational efficiency or instead introduced new vulnerabilities. The variation in outcomes, where some banks report strong profitability while others face rising costs, regulatory penalties, and heightened risk exposures, further highlights the uncertainty surrounding fintech's contribution to bank performance. Empirical evidence provides little clarity. Much of the existing literature is drawn from advanced economies with markedly different technological and regulatory environments, limiting its relevance to Nigeria. Domestic studies often depend on cross-sectional or annual data, which cannot adequately capture the rapidly evolving nature of digital transactions, and many rely on

narrow financial ratios that overlook the multidimensional character of performance in technology-driven banking (Ehiedu et al., 2023; Muhammad, 2023; Okoro et al., 2024; Mang et al., 2023; Elle et al., 2024; John et al., 2024; Olofin et al., 2024). As a result, policymakers and practitioners lack coherent evidence to guide investment, regulatory design, and operational strategy. This substantial knowledge gap, particularly the absence of context-sensitive and time-responsive analyses of key fintech channels, poses risks for the sector, as digital expansion may outpace banks' ability to translate technology into sustainable performance gains. To address this gap, the present study provides an empirical assessment of how fintechs such as mobile banking, internet banking, ATM technology, and POS technology influence bank performance, measured through a multidimensional performance index, using quarterly industry-level data from 2012 to 2023 within an ARDL framework.

Research Objectives

The overarching aim of this study is to examine the effect of financial technology on the performance of Deposit Money Banks (DMBs) in Nigeria over the period 2012–2023. However, the specific objectives are to:

- a) Evaluate the effect of Mobile Banking on the performance of DMBs in Nigeria.
- b) Investigate the effect of Internet Banking on the performance of DMBs in Nigeria.
- c) Examine the effect of ATM on the performance of DMBs in Nigeria.
- d) Determine the effect of POS on the performance of DMBs in Nigeria.

Research Hypotheses

H0₁ - Mobile Banking has no significant impact on the performance of DMBs in Nigeria.

H0₂- Internet Banking has no significant impact on the performance of DMBs in Nigeria.

H0₃- ATM has no significant impact on the performance of DMBs in Nigeria.

H0₄- POS has no significant impact on the performance of DMBs in Nigeria.

Literature Review

Theoretical Framework

The Resource-Based View proposed by Barney (1991) is considered most appropriate to anchor this study.

Resource-Based View (RBV)

The Resource-Based View (RBV), rooted in the seminal work of Penrose (1959) and formalised by Barney (1991), posits that a firm's competitive advantage arises from its ability to harness resources that are valuable, rare, inimitable, and non-substitutable (VRIN). These resources, which could be tangible (e.g financial assets, technology, etc.), or intangible (e.g brand reputation, organisational knowledge and human capital), form the foundation of sustained performance superiority. In the context of this study, the Resource-Based View (RBV) provides a strong theoretical foundation for understanding how Nigerian Deposit Money Banks can leverage FinTech innovations, such as mobile banking, internet banking, ATMs, and POS, as strategic resources in combination with internal capabilities to gain a competitive advantage and enhance their overall performance. Unlike behavioural theories such as TAM or UTAUT, which emphasise individual adoption, RBV aligns with this study's industry-level focus and integrates well with the ARDL methodology in capturing both short- and long-run performance impacts. While critics note RBV's challenges in empirical validation, limited prescriptive guidance, and neglect of external factors such as regulation and competitive dynamics, the theory remains relevant for explaining heterogeneity in performance outcomes and for showing how traditional banking resources can synergise with FinTech tools to create sustainable competitive advantage in a rapidly evolving financial landscape.

Empirical Review

Effect of Mobile Banking Technology on the Performance of Banks

Elle et al. (2024) investigated the impact of mobile banking on banking service delivery in Nigeria from 2005 to 2022. The study employed an ex post facto research design and utilized secondary time series data sourced from the Central Bank of Nigeria statistical bulletin. Data were analysed using the autoregressive distributed lag (ARDL) model. The findings revealed that mobile banking had a significant positive impact on bank performance.

Lawrence and Donald (2023) investigated the impact of Mobile Payment on the financial performance of selected deposit money banks (DMBs) in Nigeria from 2009 to 2020. The study adopted a quantitative approach and an ex-post facto research design, utilising secondary data sourced from the Central Bank of Nigeria's statistical bulletin and the financial statements of 15 purposively selected DMBs. The Panel Autoregressive Least Squares approach was used to analyse the data. The results indicated that Mobile Payment had a significant negative impact on bank performance.

Ehiedu et al. (2023) examined the effect of mobile payments on the efficiency of banks in Nigeria from 2012 to 2016. The study adopted an ex-post facto research design and quantitative approach utilising secondary data sourced from the Central Bank of Nigeria. The data were analysed using linear regression analysis with the help of SPSS. The results showed that mobile payments had no significant effect on the efficiency of banks in Nigeria.

Effect of Internet Banking Technology on the Performance of Banks

Muhammad (2023) investigated effect of internet banking on the financial performance of deposit money banks. The study adopted a quantitative approach and an ex-post facto research design utilising secondary data sourced from Central Bank of Nigeria periodic reports and the financial reports of the selected commercial banks. The data were analysed using a multiple linear regression model with the Statistical Package for the Social Sciences (SPSS). The findings indicated that internet banking positively influences the financial performance of Nigeria's commercial banks.

Okoro et al. (2024) investigated the impact of internet banking on the performance of financial commercial banks. Employing a quantitative approach and an ex-post facto design, the study relied on secondary data sourced from the Central Bank of Nigeria (CBN) statistical bulletin, which was analysed using ordinary least squares (OLS) multiple regression analysis. The findings revealed that internet banking transactions had a negative impact on the performance of commercial banks, measured by the liquidity ratio. While the study provides valuable insights, its use of a single

financial performance metric, the liquidity ratio, limits a comprehensive understanding of performance outcomes.

Mang et al. (2023) examined the impact of internet banking on the profitability of Guaranty Trust Bank (GTB) in Nigeria from 2009 to 2016. The study adopted a quantitative approach and an ex post facto design, utilising secondary data from the Central Bank of Nigeria (CBN) bulletins, the National Bureau of Statistics (NBS) and the financial reports of the bank. The data were analysed using multiple regression analysis. The findings revealed that internet banking had no significant impact on profitability.

Effect of Automated Teller Machine (ATM) Technology on the Performance of Banks

John et al. (2024) examined the impact of Automated Teller Machine (ATM) on the performance of deposit money banks and small and medium enterprises (SMEs) in Nigeria. The study adopted a quantitative approach and an ex-post facto research design, utilising secondary data collected from the annual financial reports of the selected firms. The data were analysed using the Auto-Regressive Distributed Lag (ARDL) technique. The results revealed that the volume of Automated Teller Machine (ATM) transactions had a significant positive impact on bank performance, as measured by Return on Asset (ROA), Return on Interest (ROI) and Earnings per Share (EPS).

Olofin et al. (2024) investigated the relationship between Automated Teller Machines (ATMs) and the financial performance of listed deposit money banks from 2010 to 2021. Using an ex-post facto research design and census sampling, the study included all 25 deposit money banks quoted on the Nigerian Stock Exchange. Secondary data was sourced from the banks' annual reports, and correlation and multiple regression analyses were employed to analyse the data. The findings revealed that Automated Teller Machines (ATMs) had a significant negative impact on financial performance.

Nwayen et al. (2024) investigated the impact of Automated Teller Machines (ATM) on the profitability of Listed Deposit Money Banks in Nigeria from 2010 to 2019. The study adopted a quantitative approach and an ex-post facto research design, utilising secondary data obtained from the Central Bank of Nigeria Bulletin and the financial reports of five purposively selected deposit

money banks listed on the Nigerian Stock Exchange (NSE), including Zenith Bank Plc, Unity Bank Plc, Fidelity Bank Plc, United Bank for Africa Plc, and Wema Bank Plc. The data were analysed using regression analysis and correlation analysis. With the help of SPSS version 20. The outcome showed that automated teller machines had no statistically significant impact on the profitability of Nigeria's listed banks as measured by Return on Assets.

Effect of Point-of-Sale (POS) Technology on the Performance of Banks

Lawrence and Donald (2023) investigated the impact of Point of Sales (POS) on the financial performance of selected deposit money banks (DMBs) in Nigeria from 2009 to 2020. The study adopted a quantitative approach and an ex-post facto research design, utilising secondary data sourced from the Central Bank of Nigeria's statistical bulletin and the financial statements of 15 purposively selected DMBs. The Panel Autoregressive Least Squares approach was used to analyse the data. The results indicated that Point of Sales (POS) transactions had a significant positive impact on bank performance.

Osakwe and Akunna (2023b) assessed the effect of Point of Sale (POS) terminals on the total deposits of deposit money banks in Nigeria from 2009 to 2021. The study adopted a quantitative approach and an ex post facto design, utilising secondary annual time series data sourced from the Central Bank of Nigeria Statistical Bulletin. The data were analysed using Ordinary Least Squares (OLS). The findings revealed that Point of Sale (POS) terminals had a negative impact on total deposits.

Emenyonu et al. (2023) examined the relationship between Point of Sales (POS) and the performance of deposit money banks in Nigeria from 2005 to 2020. The study adopted a quantitative approach and an ex-post facto research design utilising secondary data sourced from the Nigerian Exchange Group (NEG) Fact Book and the Central Bank of Nigeria Bulletin. A Vector Auto Regression (VAR) model was employed for analysis using the E-view 10 statistical package. The findings revealed that Point of Sales (POS) usage had no significant impact on performance as measured by Return on Assets (ROA) and Earnings per Share (EPS).

Conceptual Framework

This study examines the effect of financial technology on the performance of Deposit Money Banks (DMBs) in Nigeria. The conceptual framework for this study is illustrated in Figure 2.1 below.

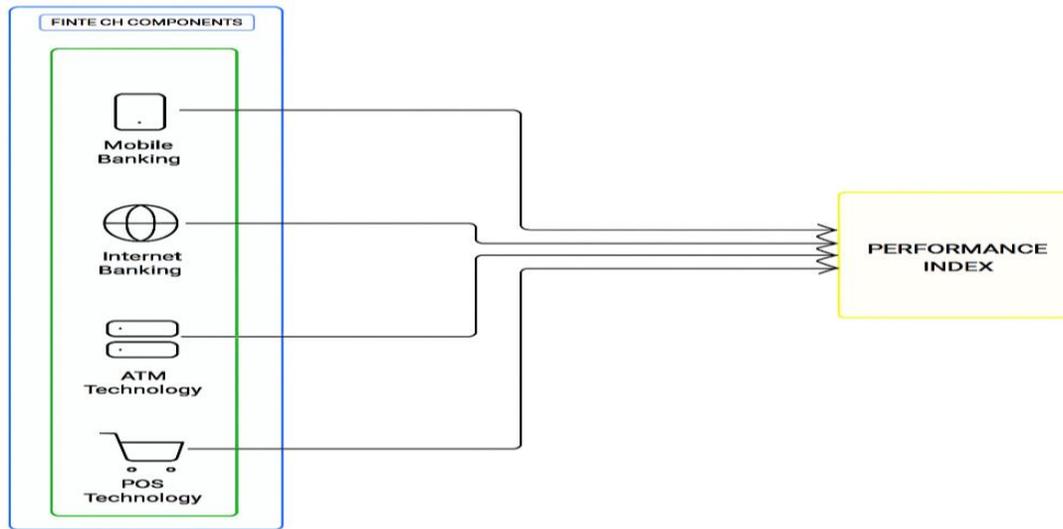


Figure 2.1: *Conceptual Framework*

The conceptual framework in Figure 2.1 above illustrates the hypothesised relationship between financial technology (FinTech) and the performance of deposit money banks in Nigeria as per this study. On the left, four FinTech channels, including mobile banking, internet banking, ATM technology, and POS technology, are specified as independent variables. These represent the most widely adopted digital tools in Nigeria's banking sector, each aimed at improving transaction efficiency, accessibility, customer experience, and operational effectiveness. Arrows extending to the right indicate their assumed influence on bank performance, measured through a composite Performance Index derived from the CAMELS framework. The model theorises that the adoption of FinTech innovations affects bank performance either individually or collectively. It is anchored on the Resource-Based View (RBV), which posits that firms gain sustained competitive advantage by leveraging valuable, rare, inimitable, and non-substitutable resources, in this case, technological capabilities. This framework is also supported by empirical evidence that digital innovations in banking enhance efficiency, broaden financial access, reduce costs, and improve service delivery, thereby shaping overall performance outcomes.

Methodology

This study adopts a quantitative approach and an ex-post facto research design because the events of interest, FinTech adoption and bank performance, have already taken place and cannot be influenced by the researcher. The population of this study comprises all 36 licensed Deposit Money Banks (26 Commercial, 6 Merchant, and 4 Non-Interest banks) in Nigeria as of December 31, 2023 (see Appendix 1). The study employs a census sampling technique because the population is relatively small and manageable, the data for the Fintech channels are only available in aggregate form at the industry level, and census sampling eliminates the risk of sampling bias, allowing the analysis to fully capture variations across the sector. The study utilises secondary quarterly data from 2012 to 2023, sourced from reputable institutions such as the Central Bank of Nigeria (CBN), the Nigeria Deposit Insurance Corporation (NDIC), and the National Bureau of Statistics (NBS). The dependent variable, bank performance, is measured using a multidimensional Performance Index (PI) adopted from Suat et al. (2011), while FinTech adoption is represented by mobile banking, internet banking, ATMs, and POS transaction volumes. To analyse the relationship between these variables, the Autoregressive Distributed Lag (ARDL) framework is employed, as it is well-suited for time-series data with mixed levels of integration and relatively small samples. The ARDL model also enables the study to capture both short-run and long-run effects. Pre-estimation and post-estimation tests are conducted to ensure the reliability and robustness of the findings. The model specified for the analysis is given below:

$$PI_t = \alpha + \beta_1 MBT_t + \beta_2 IBT_t + \beta_3 ATM_t + \beta_4 POS_t + \mu_t$$

Where:

PI_t = Performance Index (dependent variable)

MBT_t = Mobile Banking Transactions

IBT_t = Internet Banking Transactions

ATM_t = Automated Teller Machine Transactions

POS_t = Point-of-Sale Transactions

α = constant, $\beta_1 \dots \beta_4$ = coefficients, and μ_t = stochastic error term.

To account for long-run relationships, the logarithmic form will be specified as:

$$LPI_t = \alpha + \beta_1 LMBT_t + \beta_2 LIBT_t + \beta_3 LATM_t + \beta_4 LPOS_t + \mu_t$$

The associated error correction model is specified as:

$$\Delta PI_t = \alpha + \sum_{i=1}^m \phi_i \Delta PI_{t-i} + \sum_{j=0}^n \theta_j \Delta MBT_{t-j} + \sum_{k=0}^p \gamma_k \Delta IBT_{t-k} + \sum_{r=0}^s \eta_r \Delta ATM_{t-r} + \sum_{u=0}^v \lambda_u \Delta POS_{t-u} + \Omega ECT_{t-1} + \mu_t$$

Where:

Δ = first difference operator

ECT_{t-1} = error correction term

Ω = coefficient of adjustment (expected to be negative and significant)

Data Analysis and Results

Descriptive Statistics

The summary of the descriptive statistics of the dependent and independent variables is presented in Table 4.1

Table 4.1: Descriptive Statistics

	PI	MBT	IBT	ATM	POS
Mean	3426035.9	195408255.0	1100752476.3	221734911.0	377985981.6
Median	1250055.4	14673341.0	9687203.0	202666770.0	50549013.5
Maximum	86574135.5	1596241648.0	5747293643.0	530029056.0	2649056326.0
Minimum	245385.6	212195.0	374409.0	64818941.0	118620.0
Std. Dev.	12323895.6	371466386.7	1778725645.0	130823557.4	706024989.6
Skewness	6.5990	2.5076	1.3975	0.7816	2.2176
Kurtosis	45.0274	8.4324	3.6555	2.5441	6.8399
Jarque-Bera	3880.9759	109.3238	16.4838	5.3025	68.8296
Probability	0.0000	0.0000	0.0003	0.0706	0.0000
Observations	48	48	48	48	48

As shown in Table 4.1, PI exhibits substantial volatility, as indicated by the wide gap between mean and median values, extreme skewness (6.5990), and leptokurtosis (45.0274). The highly significant Jarque-Bera statistic confirms non-normality, suggesting that DMB performance has

been punctuated by episodes of sharp but unsustainable surges, possibly associated with technological adoption phases or regulatory reforms.

The financial technology variables exhibit heterogeneous adoption patterns. Mobile Banking Technology (MBT) recorded an average transaction volume of 195,408,255 compared with a much lower median of 14,673,341; its skewness (2.5076) and kurtosis (8.4324) highlight uneven but rapid expansion characterised by sharp spikes in usage. The highly significant Jarque-Bera statistic (109.32; $p = 0.0000$) confirms strong deviation from normality, indicating that mobile banking adoption has been concentrated in periods of explosive growth. Point-of-Sale (POS) technology shows a similar trajectory, with a mean of 377,985,982 transactions against a median of 50,549,014, skewness of 2.2176, and kurtosis of 6.8399. The Jarque-Bera statistic (68.83; $p = 0.0000$) reinforces its non-normal distribution, reflecting volatility in usage as Nigeria's cashless policy accelerated POS adoption. Internet Banking Technology (IBT), with a mean transaction volume of 1,100,752,476 compared to a median of only 9,687,203, displays positive skewness (1.3975) and moderate kurtosis (3.6555). Here too, the Jarque-Bera result (16.48; $p = 0.0003$) rejects normality, suggesting gradual but uneven growth concentrated in a few high-volume years. By contrast, Automated Teller Machine (ATM) usage appears the most stable, with average and median volumes (221,734,911 and 202,666,770, respectively) closely aligned, skewness of 0.7816, and kurtosis of 2.5441. The Jarque-Bera statistic (5.30; $p = 0.0706$) does not reject the null of normality at the 5 percent level, underscoring ATM's maturity and entrenched role as a conventional transaction channel within Nigeria's banking sector.

Test for Multicollinearity

A Pearson correlation matrix was generated to assess the degree of linear association between the independent variables and potential multicollinearity issues. The result of the Pearson correlation is presented in the table below:

Tables 4.2: *Correlation Matrix*

Probability	LPI	LMBT	LIBT	LATM	LPOS
LPI	1				
LMBT	0.1151	1			
LIBT	0.0691	0.8577	1		
LATM	-0.1488	0.8235	0.8828	1	
LPOS	0.0560	0.8737	0.8535	0.8629	1

Based on the submission of Goldberger (1991), the estimated results of various pairs of correlation analyses between the variables of interest in Table 4.2 are all below 0.9 and, as such, not too high to result in multicollinearity in the subsequent models estimated.

Unit Root Test and Order of Integration

The Augmented Dickey–Fuller (ADF) test (Dickey & Fuller, 1979) was used to determine the order of integration, with the null hypothesis of a unit root rejected when the absolute value of the test statistic exceeds the corresponding critical value (Gujarati, 2004; Granger & Newbold, 1974). The result of the Unit Root test is presented below;

Table 4.3: *Summary of Unit Root and Cointegration Tests*

Variable	Test in Level			Test in First Difference			Order of Integration
	ADF Test Statistic	Critical Value 5% Level	P-value	ADF Test Statistic	Critical Value 5% Level	P-value	
LPI	-3.1554	-2.9266	0.0294	11.0256	-2.9266	0.0000	I(0)
LMBT	-1.7705	-2.9252	0.3902	-4.9755	-2.9266	0.0002	I(1)
LIBT	-0.2332	-2.9252	0.9267	-7.1792	-2.9266	0.0000	I(1)
LATM	-1.4727	-2.9252	0.5386	-8.9103	-2.9266	0.0000	I(1)
LPOS	-2.7154	-2.9252	0.0790	-7.8940	-2.9266	0.0000	I(1)

As illustrated in Table 4.3, the variables are integrated of mixed order (I(0) and I(1)). Whereas Performance Index (LPI) is stationary at level, I(0), all FinTech proxies, mobile banking, internet banking, ATM, and POS transactions, are stationary only after first differencing, I(1), with no variable integrated of order two, thereby satisfying the precondition for applying the ARDL bounds testing approach (Pesaran et al., 2001).

Bounds Cointegration Test

Because the variables in this study are integrated of mixed orders, the ARDL bounds test proposed by Pesaran et al. (2001) was employed to examine cointegration. The outcome of the test is presented below;

Table 4.4: *ARDL Long Run Form and Bounds Test*

F-statistic = 13.2124		10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
40	2.427	3.395	2.893	4	3.967	5.455	
45	2.402	3.345	2.85	3.892	3.892	5.173	
Asymptotic	2.2	3.09	2.56	3.49	3.29	4.37	

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

As shown in Table 4.4 above, the ARDL bounds test reveals an F-statistic of 13.21, which far exceeds the upper-bound critical value at the 5% significance level (I(1) = 4.00). This confirms the existence of a long-run cointegrating relationship between bank performance and FinTech adoption, thus further validating the ARDL framework for further estimation of both short-run and long-run dynamics.

Furthermore, to determine the lag length, a lag structure analysis was computed. The lag order selection criteria indicate that most information criteria (AIC, FPE, LR, and HQ) consistently select lag length 4 as optimal, while the Schwarz Criterion (SC) suggests a more parsimonious lag (lag 1). Following Lütkepohl's (2005) recommendation to prioritise model fit and robustness, the study adopts lag 4.

Short Run Estimation

The output of the short-run estimation is presented in the table below.

Table 4.6: *Short Run Relationship*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.22094599	0.07979285	2.76899495	0.00873625
D(LPI(-4))	-0.04471294	0.11972192	-0.37347333	0.71092761
D(LMBT(-4))	-0.82212372	0.49609523	-1.65718933	0.10593799
D(LIBT(-4))	-0.62677533	0.34393446	-1.8223685	0.00764891
D(LATM(-4))	1.11301678	1.00565145	1.10676197	0.27554077
D(LPOS(-4))	-1.47155664	0.50488952	-2.91461121	0.00601288
R-squared	0.33216736	Mean dependent var		-0.02445959
Adjusted R-squared	0.24191971	S.D. dependent var		0.39173902
S.E. of regression	0.34107858	Akaike info criterion		0.81537983
Sum squared resid	4.30438002	Schwarz criterion		1.06112869
Log likelihood	-11.5306664	Hannan-Quinn criter.		0.90600441
F-statistic	3.68062042	Durbin-Watson stat		2.79089523
Prob(F-statistic)	0.008379			

As depicted in Table 4.6 above, the short-run ARDL estimates reveal that two FinTech channels significantly affect the Performance Index. Internet banking transactions ($\beta = -0.63$, $p < 0.05$) exert a negative and statistically significant effect on performance and POS transactions ($\beta = -1.47$, $p < 0.05$) have a significant negative impact on performance. In contrast, mobile banking ($\beta = -0.82$, $p > 0.05$) and ATM transactions ($\beta = 1.11$, $p > 0.05$) show no significant short-run effects on performance. Overall, the model explains 33% of the short-term variation in performance ($R^2 = 0.33$), with the Durbin–Watson statistic (2.79) confirming the absence of serial correlation. In summary, the evidence suggests that in the short run, FinTech adoption in Nigeria tends to impose adjustment costs, with internet banking and POS channels weighing down bank performance before long-run benefits can be realised.

Error Correction Model Estimation

The output of the ECM estimation is shown in the table below;

Table 4.7: *Error Correction Model Estimation*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.051675	0.068067	0.759175	0.452691
D(LPI(-4))	-0.054794	0.090508	-0.605402	0.54871
D(LMBT(-4))	-0.282278	0.388233	-0.727082	0.471877
D(LIBT(-4))	-0.00421	0.28469	-0.014789	0.009883
D(LATM(-4))	0.079545	0.784135	0.101444	0.919761
D(LPOS(-4))	-0.721	0.406455	-1.773875	0.008454
ECM(-1)	-0.86241	0.160789	-5.363612	0.000005
R-squared	0.6288	Mean dependent var		-0.02446
Adjusted R-squared	0.566934	S.D. dependent var		0.391739
S.E. of regression	0.257795	Akaike info criterion		0.274594
Sum squared resid	2.392491	Schwarz criterion		0.561301
Log likelihood	1.096239	Hannan-Quinn criter.		0.380322
F-statistic	10.163815	Durbin-Watson stat		1.948494
Prob(F-statistic)	0.000001			

The ECM results, as shown in Table 4.7 above, confirm the existence of a stable long-run relationship between bank performance and FinTech adoption. The error correction term is negative and highly significant ($\beta = -0.86$, $p < 0.05$), indicating that about 86% of short-run disequilibria are corrected within a single quarter. This rapid adjustment highlights the responsiveness of Nigeria's banking sector to shocks in FinTech adoption and performance dynamics.

Mobile Banking Technology: Consistent with the short-run estimates, mobile banking transactions ($\beta = -0.28$, $p > 0.05$) have a statistically insignificant negative effect on performance, implying that while adoption is growing, its benefits have yet to translate into measurable performance gains, possibly due to high transaction costs or limited penetration among rural users. This outcome agrees with Ehiedu et al. (2023), who found that mobile payments had no significant effect on the efficiency of banks in Nigeria. However, it contradicts Elle et al. (2024), who found that mobile banking had a significant positive impact on bank performance as well as Lawrence and Donald (2023), who found that Mobile Payment had a significant negative impact on the performance of selected deposit money banks (DMBs) in Nigeria from 2009 to 2020.

Internet Banking Technology: Consistent with the short-run estimates, internet banking transactions ($\beta = -0.0042$, $p < 0.05$) exert a statistically significant negative effect on performance, suggesting that while digital adoption is expanding, high operational costs, cybersecurity challenges, and incomplete integration with legacy systems may be eroding profitability. This result partially corroborates Okoro et al. (2024), who also reported adverse effects, but diverges from Muhammad (2023), who found a positive influence of internet banking on financial performance.

Automated Teller Machines: Consistent with the short-run estimates, ATM transactions ($\beta = 0.08$, $p > 0.05$) have a statistically insignificant positive effect, suggesting that ATMs continue to provide stability in cash-based services but no longer serve as a major driver of performance in the increasingly digital banking environment. This finding supports Nwayen et al. (2024), who found that automated teller machines had no statistically significant impact on the profitability of Nigeria's listed banks from 2010 to 2019, as measured by Return on Assets. However, it is incongruent with John et al. (2024), who found that Automated Teller Machine (ATM) transactions had a significant positive impact on bank performance, as measured by Return on Asset (ROA), Return on Interest (ROI) and Earnings per Share (EPS). The outcome also contravenes Olofin et al. (2024), who demonstrated that Automated Teller Machines (ATMs) had a significant negative impact on the financial performance of listed deposit money banks in Nigeria from 2010 to 2021.

Point-Of-Sale Technologies: Consistent with the short-run estimates, POS transactions ($\beta = -0.72$, $p < 0.05$) demonstrate a statistically significant negative effect on performance. This is consistent with structural inefficiencies in Nigeria's POS ecosystem, including settlement delays, fraud risks, and low-margin fee structures. This finding aligns with Osakwe and Akunna (2023b) and Emenyonu et al. (2023), who documented similar adverse impacts of POS usage on banking outcomes. However, it contrasts with Lawrence and Donald (2023), who found positive contributions in other contexts, suggesting that institutional and infrastructural differences shape the net performance effect of POS adoption.

The overall model demonstrates strong explanatory power ($R^2 = 0.63$; adjusted $R^2 = 0.57$), absence of serial correlation (Durbin–Watson ≈ 1.95), and statistical robustness (F-statistic, $p < 0.001$). Collectively, the ECM findings suggest that while Nigerian banks adjust quickly to technological shocks, as evidenced by the significant and negative error correction term, the short-run and long-run benefits of FinTech adoption remain uneven. Instead of enhancing performance, certain channels, particularly POS and internet banking, appear to undermine it due to operational inefficiencies and structural limitations. This highlights the need for policy interventions and strategic realignments to ensure that digital transformation translates into tangible performance gains.

Conclusion and Recommendations

This study examined the effect of financial technology, proxied by mobile banking, internet banking, ATM, and POS transactions, on the performance of Deposit Money Banks (DMBs) in Nigeria between 2012Q1 and 2023Q4, using the ARDL framework. The bounds test confirmed a long-run relationship, while the error correction model indicated a high speed of adjustment, with 86% of short-run disequilibria corrected within one quarter. The results reveal that POS and internet banking transactions exert significant negative effects on bank performance in both the short and long run, reflecting structural inefficiencies, high operational costs, cybersecurity vulnerabilities, and low-margin revenue structures. Mobile banking had an insignificant negative effect, suggesting suboptimal penetration, while ATM transactions showed an insignificant positive effect, reflecting maturity and declining marginal relevance. Overall, FinTech adoption has expanded access but has yet to translate into consistent performance gains for Nigerian banks. Policy and strategic interventions are therefore required. Banks should deepen mobile banking penetration by extending services to underserved areas, simplifying platforms, and reducing charges. Internet banking requires cost restructuring and strengthened cybersecurity to convert adoption into sustainable profitability. ATM technology should be repositioned as hybrid service points to complement digital channels, while reforms to the POS ecosystem, particularly settlement efficiency, fraud control, and fee structures, are critical for improving returns. The study is limited by its reliance on aggregate industry data and its exclusion of emerging FinTech innovations. Future research should employ bank-level panel data, expand the scope of technological indicators, and incorporate qualitative dimensions such as consumer experience and

risk perception. Comparative analysis across African markets is also recommended to illuminate the institutional factors that shape the FinTech–performance nexus.

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