



Digital Payment Adoption and Profitability Spillovers in Nigerian Deposit Money Banks: A Sectoral Analysis

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Abstract

This study examined the effect of digital payment adoption on profitability spillovers in Nigerian Deposit Money Banks between 2013 and 2023. The specific objective was to assess how Electronic Banking Income (EBI), POS Terminals Deployment (POSD), Mobile Banking Transaction Volume (MBTV), ATM Transaction Value (ATMV), and Internet Banking Income (IBI) influence ROA. Using panel data from five leading Nigerian banks and applying panel least squares regression analysis, the study found that none of the examined digital payment variables had a statistically significant effect on ROA. Electronic Banking Income ($\beta = -0.001094$, $p = 0.2061$), POS Terminals Deployment ($\beta = -0.000635$, $p = 0.1499$), Mobile Banking Transaction Volume ($\beta = 6.96E-07$, $p = 0.8634$), ATM Transaction Value ($\beta = 1.42E-06$, $p = 0.0994$), and Internet Banking Income ($\beta = -0.001335$, $p = 0.3330$) all exhibited statistically insignificant relationships with ROA, indicating limited direct impact on bank performance over the study period. Descriptive statistics revealed considerable variability across banks in digital payment adoption levels and ROA, reflecting differences in operational scale, market reach, and strategic execution. The findings suggest that while digital payment adoption is important for operational modernization, other factors such as macroeconomic conditions, regulatory frameworks, management practices, and market competition play a more prominent role in shaping ROA. The study concludes that banks should adopt a holistic strategy that integrates digital payment initiatives with broader performance and risk management measures to improve long-term asset returns.

Keywords: Return on Assets, Digital Payment Adoption, Electronic Banking Income, POS Terminals, Mobile Banking, ATM Transactions, Internet Banking.

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Introduction

Digital innovations have transformed banking worldwide, and Nigeria has not been left behind. Over the past decade, many Nigerian banks have embraced electronic banking channels, such as automated teller machines (ATMs), POS terminals, mobile banking and internet banking, in response to growing demand for faster and more convenient financial services. As a result, digital payment adoption is increasingly viewed as central to modern banking operations and competitiveness (Osakwe, Obi-Nwosu & Anachedo, 2024).

Empirical studies have explored how electronic banking affects bank performance in Nigeria. For example, Demaki, Eromafuru & Festus (2021) found that mobile banking, ATM services and POS operations had statistically significant positive effects on return on assets (ROA), a common indicator of financial performance. Similarly, Obumneke, Musa & Joshua (2023) showed that POS transactions were positively associated with ROA over a long-run period, implying that banks can benefit financially from increased digital transaction volumes. These studies suggest that digital payment adoption can enhance banks' ability to generate returns on their assets.

However, not all evidence is uniformly positive. A panel study by Egbadju & Donald (2023) revealed that while some digital channels had positive impacts on bank performance, others such as ATM and some mobile payment systems had negative or insignificant effects. This divergence indicates that the benefits of digital banking may vary depending on the channel, the implementation quality, and underlying operational costs. In another recent work, Busari & Jayeoba (2022) reported that increased mobile banking transactions significantly improved ROA for sampled banks, but POS-based transactions had a negative effect, highlighting potential inefficiencies or high costs associated with certain digital channels.

Existing literature shows a paucity of studies covering a long time span across multiple banks in Nigeria. Most analyses focus on short periods or limited samples, which constrains the ability to observe long-term trends or "spillover effects" across different digital payment mechanisms. A sector-wide analysis covering multiple banks over the period 2013 to 2023 would provide a more robust basis for understanding how digital payment adoption affects financial performance over time, capturing the dynamic nature of technological adoption and macroeconomic fluctuations.

Moreover, given these mixed findings and gaps in time-span coverage, there remains a need for a comprehensive study that examines different dimensions of digital payment adoption including ATM transactions, mobile banking volume, POS deployment, internet banking usage and their effects on ROA across a broad sample of deposit money banks over an extended period (2013–2023). Such a study will help clarify which digital channels contribute most effectively to financial performance and whether adoption results in sustainable profitability spillovers.

Statement of the Problem

The ideal scenario in the Nigerian banking sector is one in which deposit money banks fully adopt digital payment systems across all operational channels, such as mobile banking, internet banking, ATMs, and POS terminals. In this scenario, banks efficiently process transactions, expand financial inclusion, minimize operational costs, and maximize the return on assets (ROA), thereby sustaining profitability and competitiveness in a rapidly evolving financial environment.

However, the current reality deviates from this ideal. Despite significant investment in digital infrastructure, many Nigerian banks experience uneven adoption of digital payment channels, operational inefficiencies, and inconsistent utilization of technology. Some channels, such as POS or ATMs, may not consistently translate into improved ROA, while other channels generate positive but uneven financial spillovers. Additional challenges, such as cybersecurity risks, system downtime, and high maintenance costs, further limit the potential benefits of digital payment

adoption. As a result, banks are unable to fully leverage technological investments to enhance financial performance.

If these problems remain unresolved, Nigerian deposit money banks risk losing operational efficiency, market competitiveness, and long-term profitability. Ineffective digital adoption may prevent banks from achieving optimal asset utilization, reduce customer satisfaction, and limit their ability to contribute to Nigeria's cashless economy goals. Furthermore, failure to understand which digital payment channels generate measurable financial spillovers may lead to misallocation of resources, resulting in higher operational costs without corresponding gains in ROA. This underscores the need for a comprehensive sectoral analysis of digital payment adoption and its effect on banks' financial performance over an extended period.

Objectives of the Study

The main objective of this study is to examine digital payment adoption and profitability spillovers in Nigerian deposit money banks: a sectoral analysis. The specific objectives are to:

- i. To examine the effect of electronic banking income on the return on assets (ROA) of Nigerian Deposit Money Banks.
- ii. To evaluate the effect of POS terminals deployment on the return on assets (ROA) of Nigerian Deposit Money Banks.
- iii. To assess the effect of mobile banking transaction volume on the return on assets (ROA) of Nigerian Deposit Money Banks.
- iv. To determine the effect of ATM transaction value on the return on assets (ROA) of Nigerian Deposit Money Banks.
- v. To investigate the effect of internet banking income on the return on assets (ROA) of Nigerian Deposit Money Banks.

Research Questions

The study provided answers to the following research questions.

- i. How does electronic banking income affect the return on assets (ROA) of Nigerian Deposit Money Banks?
- ii. What effect does POS terminals deployment have on the return on assets (ROA) of Nigerian Deposit Money Banks?
- iii. To what extent does mobile banking transaction volume influence the return on assets (ROA) of Nigerian Deposit Money Banks?
- iv. How does ATM transaction value impact the return on assets (ROA) of Nigerian Deposit Money Banks?
- v. What effect does internet banking income have on the return on assets (ROA) of Nigerian Deposit Money Banks?

Statement of Hypotheses

The following hypotheses in null form (H_0) guided this study

- i. Electronic banking income has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.
- ii. POS terminals deployment has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.
- iii. Mobile banking transaction volume has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.
- iv. ATM transaction value has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.
- v. Internet banking income has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

Review of Related Literature

Conceptual Review

Adoption of Digital Payment

The adoption of digital payment refers to the process by which individuals and firms shift from cash or paper-based transactions to payments facilitated by digital technologies like mobile wallets, online banking, or peer-to-peer payments. This transition relies on perceived usefulness and convenience: digital payments reduce transaction time, increase accessibility, and allow 24/7 financial operations. As such, adoption captures how users adjust to and accept technological payment innovations (Balakrishnan & Shuib, 2021).

Digital-payment adoption is strongly influenced by trust, security, and perceived risk: users must feel confident that their financial data and transactions are safe. Where systems guarantee confidentiality, reliability, and user control, the likelihood of adoption increases. In many empirical studies, perceived security and trust significantly drive willingness to use digital payment methods and overcome traditional cash-based skepticism (Oyelami, Adebisi & Adekunle, 2020).

Technological readiness and infrastructure also shape adoption. Availability of stable internet, smartphone penetration, and user-friendly interfaces matter as does ease of use. When digital payment platforms are intuitive and accessible, even less tech-savvy users may adopt them. Therefore, adoption is not only a matter of willingness but also of enabling environment and system design quality (Ly & Shuib, 2024).

Social and contextual factors like peer influence, social norms, and economic inclusion affect digital payment adoption. In societies where peers or reference groups increasingly use digital payment, individuals are more likely to follow. Also, demographics like education, income, and financial inclusion influence uptake. Adoption thus depends on both individual attitudes and broader societal and economic context (Ajao, Oludamilare & Sadeeq, 2023).

In essence, the concept of adoption of digital payment combines technological readiness, trust and security, perceived usefulness, and social context — all shaping whether users embrace digital financial transactions. Monitoring adoption helps stakeholders understand financial inclusion, consumer behaviour shifts, and readiness

of economies for cashless systems; moreover, widespread adoption can foster efficiency, transparency, and inclusive access to financial services.

Electronic Banking Income

Electronic Banking Income (EBI) refers to the revenue banks derive from electronic banking services such as ATM operations, point-of-sale (POS) transactions, mobile banking, and internet banking, instead of traditional teller-based services. These services transform banking operations into digital platforms, reducing the need for physical branches. As customers increase use of e-banking channels, banks expand non-interest income via service fees and commissions, thereby shifting income structure toward EBI streams (Eze & Nwankwo, 2021).

EBI embodies banks' adaptation to modern financial technology: by offering electronic banking services, banks tap into commission-based income from transactions, card operations, fund transfers, and digital payments. This diversification reduces dependence on interest income, mitigates interest-rate risk, and enhances profitability stability especially in volatile interest environments. Thus, EBI is a strategic response to evolving customer behavior and financial innovation (Lawrence & Ewanlen, 2023).

Empirical studies show that increased adoption of e-banking channels corresponds with growth in EBI and overall bank performance. In contexts where ATM, POS, and digital transaction volumes rise, banks report better financial outcomes and expanded income bases beyond lending. This demonstrates that EBI can contribute significantly to financial sustainability by leveraging technology and customer uptake of electronic services (Adiga & Haruna, 2024).

Nonetheless, the realization of EBI depends on infrastructure, customer adoption, and scale: without sufficient transaction volumes or reliable network coverage, investments in e-banking platforms may not produce expected returns. High upfront technology costs, system maintenance, and the need for customer awareness may hinder EBI growth. Hence, banks must align digital infrastructure investments with market readiness and usage patterns to optimize electronic income (Umugwaneza & Kising'u, 2023).

Furthermore, electronic banking income captures the shift in banks' revenue models from traditional interest-based income toward digital-service fees and commissions. It reflects the bank's ability to monetize electronic channels, benefit from financial technology adoption, and diversify income streams for resilience. As digital banking gains prevalence, EBI becomes critical for competitive advantage, operational efficiency, and long-term profitability, moreover driving inclusive access and modern banking growth.

POS Terminals Deployment

Deployment of POS (Point-of-Sale) terminals refers to the systematic installation and activation of electronic payment terminals at merchant locations or banking touchpoints to enable cashless transactions. This deployment transforms traditional cash-based exchanges into digital transactions, allowing merchants to accept card, mobile, or electronic payments in real time. POS deployment thus serves as the infrastructural backbone of modern payment systems, broadening access to electronic banking and commerce (Ogunsuyi & Siyanbola, 2022).

When POS terminals are deployed widely, across retail shops, SMEs, service providers, and banks, they facilitate improved transaction efficiency, reduce reliance on physical cash, and support financial inclusion. Studies show that POS deployment helps SMEs expand payment options, attract more customers who prefer cashless payments, and enhance overall business performance and liquidity, by offering secure, quick payment services (Oladejo & Deji-Adisa, 2023).

Effective POS deployment also depends on enabling factors such as stable network infrastructure, reliable electricity, merchant and customer awareness, and favourable regulatory environment. Without adequate

connectivity or infrastructure support, POS terminals may be underutilized, diminishing their potential benefits. Thus, deployment must be coupled with supportive systems for POS to contribute meaningfully to payment modernization (Nworie & Okafor, 2023).

Despite benefits, POS deployment faces challenges: transaction fees, irregular connectivity, security concerns, and sometimes low user trust deter both merchants and consumers. In many deploying economies, these factors limit POS usage even when terminals are available. Therefore, successful deployment must address cost, security, and trust issues to realize expected gains in cashless transactions and financial inclusion (Hezekiah, Mokuolu & Fayomi, 2023).

In sum, POS terminals deployment represents a structural shift in payment infrastructure, enabling electronic commerce, supporting SMEs, reducing cash dependency, and fostering financial inclusion. Widespread deployment, when matched with good infrastructure, regulatory support, and trust-building can accelerate digital payment adoption and transform retail and banking operations, moreover strengthening financial system efficiency and outreach in developing economies.

Mobile Banking Transactions Volume

Mobile Banking Transactions Volume refers to the total number or frequency of transactions processed through a bank's mobile-banking channel over a given period. It captures how many transactions, such as fund transfers, payments, deposits, or withdrawals, customers perform via mobile devices. High MBTV reflects widespread usage and acceptance of mobile banking, indicating active customer engagement, strong digital channel utilisation, and a shift from traditional banking channels to mobile platforms (Aduku, Bakare & Ogedengbe, 2025).

MBTV is often used as a proxy for digitalisation performance because it quantifies the extent to which customers adopt mobile banking services. As transaction volume increases, banks may enjoy economies of scale, lower per-transaction costs relative to branch processing, and improved operational efficiency. Thus, higher MBTV offers a dynamic indicator of how effectively banks implement digital strategy and migrate customers toward mobile banking channels (Ashiru & Sinclair, 2023).

Empirical evidence demonstrates that rising mobile-banking transaction volumes positively correlate with enhanced bank profitability through increased non-interest income and reduced overhead costs. For example, in contexts where MBTV surged, banks reported improved profit after tax (PAT), suggesting that volume-driven mobile banking can contribute significantly to financial performance by leveraging technology to scale services cost-effectively (Enadeghe & Shaba, 2025).

Nonetheless, the benefits of high MBTV depend on supporting infrastructure, customer readiness, and secure systems. Without reliable internet connectivity, user-friendly applications, and robust cybersecurity, volume growth may stagnate or attract operational risks. Therefore, while MBTV reflects digital adoption, its sustainability requires continuous investment in technology, user education, and regulatory compliance to maintain trust and consistent service quality (Kawamoto, Fleury & Yoshida, 2023).

In essence, Mobile Banking Transactions Volume serves as a vital metric for assessing the uptake and intensity of mobile banking usage, offering a quantifiable measure of digital banking adoption and channel shift. It links customer behaviour with operational and financial outcomes, enabling banks and researchers to track digital transformation progress, evaluate scale benefits, and design strategies to deepen mobile banking penetration, moreover guiding policies for cost-efficiency, inclusion, and sustainable banking growth.

ATM Transactions Value

ATM Transactions Value denotes the aggregate sum of money withdrawn via ATMs over a given period. This value reflects not just the frequency of cash withdrawals but the actual cash flow mobilized through ATM networks. Monitoring this metric helps gauge public reliance on cash, the liquidity needs met via ATMs, and the magnitude of cash demand serviced outside bank branches (Cronin & McNerney, 2022).

The value of ATM transactions is a key indicator of cash usage and monetary demand in economies. Even as digital payment alternatives expand, ATM withdrawals by value reveal persistent cash demand, especially in periods of economic stress, inflation, or when digital infrastructure is weak. Studies show that cash withdrawals by value often correlate with inflationary pressures and consumer preference for liquidity and anonymity (Suder et al., 2023).

From a bank's perspective, ATM transaction value influences cash-management strategies, network servicing costs, and overall operational efficiency. High withdrawal values require greater cash replenishment frequency, affect logistics and cash transport, and influence cost structures for ATM maintenance and cash-in-transit operations. Effective forecasting and management of ATM transaction value are thus essential for cost containment and service reliability (Fallahtafti et al., 2022).

Changes in ATM transaction value often mirror broader shifts in payment behaviors and macroeconomic events, for example crises, pandemics or regulatory changes, which can depress or spike cash withdrawals. During such events, ATM transaction value may dip due to reduced cash demand or restrictions, or increase sharply due to hoarding or withdrawal surges. Thus, ATM value data can serve as a proxy for analyzing societal and economic stress responses (Suder, 2024).

Moreso, ATM Transactions Value provides a comprehensive measure of how much cash flows through ATM networks, capturing the financial weight of cash usage beyond mere count of withdrawals. It helps stakeholders - banks, regulators, policymakers - understand real cash demand, plan for liquidity distribution, manage operational costs, and monitor shifts toward or away from cash-based transactions; moreover it remains vital for analyzing payment-system resilience and public cash dependency.

Internet Banking Income

Internet Banking Income refers to the revenues that a bank generates through online banking services, such as online transfers, bill payments, e-statements, and other digital banking offerings instead of branch-based services. As customers increasingly use internet platforms to perform banking operations, banks collect fees, commissions, and service charges, thereby diversifying income beyond traditional interest-based earnings. Essentially, IBI reflects the shift of banking value creation into digital channels (Li, 2022).

IBI is part of a broader shift toward non-interest income sources, which helps banks reduce reliance on interest rate spreads. Internet banking enables cost-efficient delivery of banking services, reducing branch-related overheads and enabling scalable service delivery. As a result, banks with active internet-banking platforms often see improved income stability and more balanced revenue structures. Thus, IBI serves as a strategic tool for income diversification and resilience (Efuntade, 2023).

Empirical studies have linked increased adoption of internet banking to higher non-interest income and improved overall bank profitability. As more users transact online, volume and variety of digital transactions increase service-based income, enhancing financial performance indicators. This suggests that IBI plays a significant role in modern bank profitability, especially in environments where digital banking adoption is rising rapidly (Abu Khalaf, Awad & Ellis, 2024).

However, the generation of IBI depends on supporting infrastructure, customer access, regulatory environment, and digital literacy. In markets where internet penetration, cybersecurity, and customer trust are weak, internet banking may fail to yield significant income. Additionally, competition among banks and FINTECH platforms may compress fees. Thus, IBI's success as a revenue stream requires robust digital infrastructure and a supportive environment (Yang, 2023).

In sum, Internet Banking Income encapsulates how banks monetize digital banking services, transitioning revenue generation from traditional interest spreads toward fees and service-based earnings. It underlines the role of digitalization in reshaping banking business models, encouraging cost efficiency, revenue diversification, and financial inclusion moreover offering a sustainable path for banks adapting to evolving customer behavior and technological progress.

Profitability

Profitability denotes a firm's capacity to generate earnings from its resources over a period, showing whether revenues exceed costs after accounting for operating and financing items. As a fundamental performance indicator, profitability captures efficiency in converting inputs (assets, labour, capital) into surplus. Analysts use profitability to assess managerial effectiveness, track competitive advantage, and compare firms across industries and time using ratios like ROA, ROE and profit margins (Yin & Yang, 2022).

Beyond simple earnings, profitability is conceptually decomposed into drivers such as margins, turnover and funding mix to reveal underlying performance sources. Decomposition methods (DuPont-style or advanced reforms) separate operating profitability from financing effects, enabling clearer diagnosis of whether profit changes stem from pricing, cost control, asset use, or capital structure. These decompositions support targeted managerial actions to lift profitability sustainably (Nissim, 2022).

Profitability is also dynamic: its level, growth, and acceleration contain distinct information about firm prospects and market valuation. Empirical asset-pricing and corporate studies show that persistent or rising profitability predicts future returns and firm resilience, while volatile or declining profitability signals increased risk. Thus, researchers emphasise measuring both static profitability and its temporal trends for richer performance assessment (Mansikkamäki, 2023).

Measuring profitability rigorously requires attention to measurement choices and efficiency concepts: profit, profitability, cost and revenue efficiency are related but distinct constructs. Data-envelopment and efficiency frameworks help separate technical performance from allocative/pricing effects, offering nuanced measures of profitability that account for industry structure and input–output heterogeneity. Such methods refine interpretation beyond headline ratios and support cross-firm benchmarking (Barbero & Zofío, 2023).

In short, profitability expresses a firm's ability to create surplus from operations and financing choices; it is both a descriptive outcome and a diagnostic tool for strategy. By decomposing profitability into margins, turnover, funding and efficiency terms, managers and researchers can identify improvement levers, align investment decisions with value creation, and track sustainable performance changes, moreover, profitability remains central to valuation, governance, and stakeholder assessment.

Return on Assets

Return on Assets (ROA) is a financial ratio that measures how efficiently a firm uses its total assets to generate net income. It is calculated as net income divided by average (or total) assets, expressing profit per unit of assets employed. As such, ROA captures the firm's ability to convert asset base into earnings reflecting operational efficiency regardless of how the assets are financed (Karadayi, 2023).

ROA serves as a core profitability benchmark because it standardizes profit against assets, enabling comparison across firms of different sizes. By using total assets in the denominator, ROA assesses management's skill in deploying resources whether fixed assets, working capital or intangible assets to produce returns, thus offering a comprehensive measure of asset utilization and managerial effectiveness (Fadillah, 2024).

In empirical studies, ROA is widely used as a proxy for firm performance and profitability, especially in banking and financial-sector research. For example, banks with higher ROA are found to be more efficient and financially stable, indicating good asset-quality management and effective use of loan and investment portfolios, thus ROA is often preferred in assessing financial institutions' performance (Nguyen, 2023).

However, ROA must be interpreted with caution because differences in asset structure, industry characteristics, and accounting practices can distort comparability. Capital-intensive firms may have lower ROA due to large asset bases, while service firms may show high ROA with few tangible assets. Hence, analysts often complement ROA with other ratios (like return on equity, asset turnover) to capture a holistic performance picture (Amaliyah, 2022).

Therefore, Return on Assets remains a fundamental metric for evaluating how effectively a company turns its assets into profits. It links operational performance to resource deployment, helps investors and managers gauge asset-use efficiency, and supports cross-firm and longitudinal comparisons. Moreover it remains a cornerstone in financial analysis and firm performance evaluation frameworks.

Theoretical Review

This study was theoretically underpinned by Resource-Based View (RBV)

Resource-Based View (RBV)

The Resource-Based View (RBV) is a management theory that explains how firms achieve and sustain competitive advantage through the possession and strategic utilization of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). In the context of banking, resources include tangible assets (like IT infrastructure, ATMs, POS terminals) and intangible assets (like digital capabilities, managerial skills, and organizational knowledge). RBV argues that banks that effectively leverage these resources can improve efficiency, enhance service delivery, and increase profitability. Digital payment systems, when viewed as strategic resources, can therefore create sustained competitive advantages by boosting transaction efficiency, customer satisfaction, and overall financial performance.

Relevance of the Study:

- i. RBV helps to understand why some banks gain higher returns on assets (ROA) from digital payment adoption compared to others, based on resource strength and capability.
- ii. Digital payment channels (mobile banking, POS, ATM, internet banking) are treated as resources that can generate financial performance if properly managed.
- iii. The theory underpins the study's investigation into how digital payment adoption affects ROA and profitability spillovers.
- iv. Banks with superior digital resources are more likely to achieve operational efficiency and profitability, reflecting strategic advantages in a competitive sector.
- v. RBV emphasizes the sustainability of financial gains, which aligns with the study's 2013–2023 timeframe, enabling evaluation of both direct effects and spillover benefits of digital payments.

Empirical Review

Busari & Jayeoba (2024) evaluated the influence of major digital payment channels on profitability of Nigerian deposit money banks using panel data from ten banks (2013–2022). Applying a Random Effects regression model, they found that mobile banking transactions significantly enhanced return on assets (ROA), while POS transactions had a negative significant effect and ATM usage was insignificant.

Adewumi, et al. (2023) examined how financial technology adoption affects bank performance in Nigeria by applying an ARDL model on data from two major banks (UBA & Zenith) over 2012–2019. Their findings revealed that digital payment technologies exert positive long-run effects on profitability indicators such as ROA and ROE; some channels, however, experienced short-run negative fluctuations before stabilizing positively.

Nwankwo & Okoli (2021) studied the effects of FinTech channels internet banking, mobile banking, ATM and POS on profitability using CBN time-series data for 2010–2021 with regression and Granger causality analysis. They found that internet banking had a positive and significant effect on profitability, whereas POS and mobile banking showed negative but statistically insignificant effects, suggesting not all digital channels contributed equally.

Nteegah and Oladosu (2022) assessed how electronic payment channels influence the performance of deposit money banks using an ARDL bounds testing approach on quarterly data from 2010 to 2020. They observed that ATM, mobile banking, and web-pay channels had positive and significant effects on deposit penetration (a proxy for bank performance), while POS transactions remained statistically insignificant — indicating digital payment adoption may drive deposit mobilization beyond direct profitability.

Okoro, et al. (2023) investigated the impact of digitalisation indicators (web-pay, POS, NIBSS instant payments) on broader banking stability and performance metrics using the DOLS technique. Their results revealed significant positive effects of web-pay and instant payments on capital adequacy ratios, though effects on liquidity were largely insignificant implying digital payments can strengthen regulatory capital base even if liquidity benefits are weak.

Olowolaju & Adedeji (2017) analyzed data across fifteen Nigerian deposit money banks from 2005 to 2015 via panel regression to explore how electronic payment adoption affects profitability. They found that digital payment channels especially mobile and internet banking significantly improved bank profitability, whereas POS channels showed mixed effects.

Methodology

Research Design

This study adopts an ex-post-facto research design, utilizing historical financial data from selected Nigerian Deposit Money Banks. The study covers an eleven-year period from 2013 to 2023, ensuring the inclusion of current economic trends and financial realities influencing bank performance over time.

Area of Study

The research focuses on the banking sector in Nigeria, particularly analyzing the impact of digital payment adoption on return on assets (ROA) of Nigerian Deposit Money Banks. Where applicable, data from the five sampled banks are used to provide a sectoral analysis and comparative insights across leading banks in the Nigerian banking industry.

Sources of Data

Secondary data will be collected from the audited annual reports and financial statements of the selected banks from 2013 to 2023. These sources provide comprehensive data necessary to compute the study variables, including:

Electronic Banking Income, POS Terminals Deployment, Mobile Banking Transactions Volume, ATM Transactions Value, Internet Banking Income & Return on Assets.

Population of the Study

The population comprises all Nigerian Deposit Money Banks registered and operating between 2013 and 2023. The study focuses on the top banks with reliable and consistent data for the period.

Sample Size and Sampling Technique

Using a purposive sampling technique, five Nigerian Deposit Money Banks with consistent, accessible, and reliable financial data over the study period were selected. These banks are: Access Bank Plc, United Bank for Africa (UBA) Plc, Zenith Bank Plc, Guaranty Trust Bank (GTB) Plc & First Bank of Nigeria (FBN) Plc

Model Specification

A. General Functional Form:

$ROA_{it} = f(\text{Electronic Banking Income}_{it}, \text{POS Terminals Deployed}_{it}, \text{Mobile Banking Transactions Volume}_{it}, \text{ATM Transactions Value}_{it}, \text{Internet Banking Income}_{it})$

B. Econometric Form:

$$ROA_{it} = \beta_0 + \beta_1 EBI_{it} + \beta_2 POSD_{it} + \beta_3 MBTV_{it} + \beta_4 ATMV_{it} + \beta_5 IBI_{it} + C_i + \epsilon_{it}$$

Where:

ROA_{it} = Return on Assets of bank i in year t

EBI_{it} = Electronic Banking Income of bank i in year t

$POSD_{it}$ = POS Terminals Deployed by bank i in year t

$MBTV_{it}$ = Mobile Banking Transactions Volume of bank i in year t

$ATMV_{it}$ = ATM Transactions Value of bank i in year t

IBI_{it} = Internet Banking Income of bank i in year t

β_0 = Intercept term

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ = Coefficients to be estimated

C_i = Unobserved firm-specific effects

ϵ_{it} = Error term

Method of Data Analysis

The analysis will begin with descriptive statistics to summarize central tendencies, dispersion, and trends in the dataset. For inferential analysis, Panel Data Regression, specifically the Panel Least Squares (PLS) technique, will be employed to estimate the impact of digital payment adoption variables on ROA. Additional diagnostic tests such as multicollinearity, heteroskedasticity, and autocorrelation tests will be conducted to ensure the robustness and reliability of the regression model.

Data Presentation and Analysis

Table 1: Panel Regression Analysis Result of the Time Series Data

Dependent Variable: ROA
Method: Panel Least Squares
Date: 09/30/26 Time: 03:07
Sample: 2013 2023
Periods included: 11
Cross-sections included: 5
Total panel (balanced) observations: 55

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EBI	-0.001094	0.000854	-1.281232	0.2061
POSD	-0.000635	0.000434	-1.462867	0.1499
MBTV	6.96E-07	4.03E-06	0.172962	0.8634
ATMV	1.42E-06	8.46E-07	1.679528	0.0994
IBI	-0.001335	0.001366	-0.977848	0.3330
C	288.5091	68.89713	4.187535	0.0001
R-squared	0.082797	Mean dependent var		218.8000
Adjusted R-squared	-0.010795	S.D. dependent var		67.90582
S.E. of regression	68.27137	Akaike info criterion		11.38753
Sum squared resid	228388.0	Schwarz criterion		11.60651
Log likelihood	-307.1570	Hannan-Quinn criter.		11.47221
F-statistic	0.884656	Durbin-Watson stat		2.031812
Prob(F-statistic)	0.498544			

Source: E-view 11.0 Statistical Output, 2026

Table 1 presents the results of the panel least squares regression analyzing the impact of digital payment adoption variables — electronic banking income (EBI), POS terminals deployment (POSD), mobile banking transaction volume (MBTV), ATM transaction value (ATMV), and internet banking income (IBI) - on the return on assets (ROA) of five Nigerian Deposit Money Banks over the period 2013 to 2023.

The results indicate that electronic banking income (EBI) has a negative but statistically insignificant effect on ROA (coefficient = -0.001094, $p = 0.2061$), suggesting that variations in electronic banking income do not meaningfully influence returns on assets in the sample. Similarly, POS terminals deployment (POSD) has a negative but insignificant relationship with ROA (coefficient = -0.000635, $p = 0.1499$), indicating that while banks with more POS terminals may experience slightly lower ROA, the effect is not statistically conclusive. Mobile banking transaction volume (MBTV) shows a very small positive coefficient (6.96E-07) with a high p -value (0.8634), demonstrating an essentially negligible impact on ROA.

ATM transaction value (ATMV) is positively associated with ROA (coefficient = 1.42E-06) and approaches marginal significance ($p = 0.0994$), suggesting that higher ATM transaction volumes may contribute slightly to returns on assets, although this relationship is not statistically strong. Internet banking income (IBI) has a negative but insignificant effect on ROA (coefficient = -0.001335, $p = 0.3330$), implying that variations in online banking income do not meaningfully alter bank performance in the sample period.

The constant term ($C = 288.5091$, $p = 0.0001$) is positive and highly significant, indicating the baseline level of ROA when all independent variables are zero.

The model exhibits limited explanatory power, with an R-squared of 0.0828 and an adjusted R-squared of -0.0108, suggesting that only about 8% of the variation in ROA is explained by the included digital payment variables. The F-statistic of 0.8847 ($p = 0.4985$) indicates that the model is not statistically significant as a whole, implying that collectively, the independent variables do not provide a strong predictive effect on ROA for the sampled banks. The Durbin-Watson statistic of 2.0318, being close to 2, suggests no significant autocorrelation in the residuals.

Test of Hypotheses

Test of Hypothesis One

Restatement of the Hypothesis in Null and Alternate forms:

H_{01} : Electronic banking income (EBI) has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

H_{a1} : Electronic banking income (EBI) has a significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

Statement of Decision Rule:

Reject the null hypothesis (H_0) if the p-value of the t-statistic is less than 0.05. Otherwise, accept the null hypothesis and reject the alternate hypothesis.

Decision:

From the regression result, the coefficient of EBI is -0.001094 with a t-statistic of -1.2812 and a p-value of 0.2061, which is greater than 0.05.

Therefore, H_{01} is accepted, and the alternate hypothesis is rejected. This implies that electronic banking income does not have a significant effect on the return on assets of Nigerian Deposit Money Banks during the study period.

Test of Hypothesis Two

Restatement of the Hypothesis in Null and Alternate forms:

H_{02} : POS terminals deployment (POSD) has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

H_{a2} : POS terminals deployment (POSD) has a significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

Statement of Decision Rule:

Reject the null hypothesis (H_0) if the p-value of the t-statistic is less than 0.05. Otherwise, accept the null hypothesis and reject the alternate hypothesis.

Decision:

The coefficient of POSD is -0.000635 with a t-statistic of -1.4629 and a p-value of 0.1499, which is greater than 0.05.

Hence, H_{02} is accepted, and the alternate hypothesis is rejected. This indicates that POS terminals deployment does not significantly affect the return on assets of Nigerian Deposit Money Banks during the study period.

Test of Hypothesis Three

Restatement of the Hypothesis in Null and Alternate forms:

H_{03} : Mobile banking transaction volume (MBTV) has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

H_{a3} : Mobile banking transaction volume (MBTV) has a significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

Statement of Decision Rule:

Reject the null hypothesis (H_0) if the p-value of the t-statistic is less than 0.05. Otherwise, accept the null hypothesis and reject the alternate hypothesis.

Decision:

The coefficient of MBTV is 6.96E-07 with a t-statistic of 0.17296 and a p-value of 0.8634, which is greater than 0.05.

Therefore, H_{03} is accepted, and the alternate hypothesis is rejected. This implies that mobile banking transaction volume does not have a significant effect on the return on assets of Nigerian Deposit Money Banks during the study period.

Test of Hypothesis Four

Restatement of the Hypothesis in Null and Alternate forms:

H_{04} : ATM transaction value (ATMV) has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

H_{a4} : ATM transaction value (ATMV) has a significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

Statement of Decision Rule:

Reject the null hypothesis (H_0) if the p-value of the t-statistic is less than 0.05. Otherwise, accept the null hypothesis and reject the alternate hypothesis.

Decision:

The coefficient of ATMV is 1.42E-06 with a t-statistic of 1.6795 and a p-value of 0.0994, which is greater than 0.05.

Hence, H_{04} is accepted, and the alternate hypothesis is rejected. This indicates that ATM transaction value does not have a statistically significant effect on the return on assets of Nigerian Deposit Money Banks during the study period, although the relationship is positive and marginally suggestive.

Test of Hypothesis Five

Restatement of the Hypothesis in Null and Alternate forms:

H_{05} : Internet banking income (IBI) has no significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

H_{a5}: Internet banking income (IBI) has a significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks.

Statement of Decision Rule:

Reject the null hypothesis (H₀) if the p-value of the t-statistic is less than 0.05. Otherwise, accept the null hypothesis and reject the alternate hypothesis.

Decision:

The coefficient of IBI is -0.001335 with a t-statistic of -0.9778 and a p-value of 0.3330, which is greater than 0.05.

Therefore, H₀₅ is accepted, and the alternate hypothesis is rejected. This suggests that internet banking income does not have a significant effect on the return on assets of Nigerian Deposit Money Banks during the study period.

Summary of Findings, Conclusion and Recommendations

Summary of Findings

The key findings of the study are elucidated below:

- i. Electronic Banking Income (EBI): Electronic banking income exhibited a negative and statistically insignificant effect on ROA, with a coefficient of -0.001094 ($t = -1.2812$, $p = 0.2061$). This suggests that variations in electronic banking income do not meaningfully influence the return on assets of Nigerian Deposit Money Banks.
- ii. POS Terminals Deployment (POSD): POS terminals deployment showed a negative and statistically insignificant impact on ROA, with a coefficient of -0.000635 ($t = -1.4629$, $p = 0.1499$). This indicates that the number of POS terminals deployed does not significantly affect ROA during the study period.
- iii. Mobile Banking Transaction Volume (MBTV): Mobile banking transaction volume had a positive but statistically insignificant effect on ROA, with a coefficient of 6.96E-07 ($t = 0.17296$, $p = 0.8634$). This implies that increases in mobile banking transactions do not significantly impact ROA.
- iv. ATM Transaction Value (ATMV): ATM transaction value demonstrated a positive but statistically insignificant effect on ROA, with a coefficient of 1.42E-06 ($t = 1.6795$, $p = 0.0994$). This suggests that while higher ATM transaction values may slightly enhance ROA, the relationship is not statistically strong.
- v. Internet Banking Income (IBI): Internet banking income was found to have a negative and statistically insignificant effect on ROA, with a coefficient of -0.001335 ($t = -0.9778$, $p = 0.3330$). This indicates that variations in internet banking income do not significantly influence ROA of Nigerian Deposit Money Banks during the study period.

Conclusion

The study conclusively found that none of the digital payment adoption variables — Electronic Banking Income, POS Terminals Deployment, Mobile Banking Transaction Volume, ATM Transaction Value, and Internet Banking Income - have a statistically significant effect on the return on assets (ROA) of Nigerian Deposit Money Banks from 2013 to 2023.

These results suggest that, contrary to theoretical expectations, digital payment adoption measures in isolation do not significantly determine the performance of banks in terms of ROA. It implies that other factors — such as

macroeconomic conditions, regulatory policies, market competition, risk management strategies, and overall bank management practices — may play a more prominent role in shaping banks' asset returns.

The findings highlight the complexity of bank performance determinants and suggest that digital payment adoption, while important for operational modernization, may not directly translate into measurable improvements in ROA over the study period.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

- i. Although digital payment variables did not significantly affect ROA, banks should integrate digital payment services strategically with overall revenue generation and cost management plans to potentially leverage efficiency and customer retention benefits.
- ii. Banks should focus on ensuring POS terminals are strategically deployed in high-traffic and revenue-generating locations, combining deployment with customer awareness campaigns and merchant partnerships to enhance transactional efficiency.
- iii. Banks should invest in increasing mobile banking adoption through user-friendly apps, secure authentication measures, and targeted incentives, thereby gradually translating transaction volume growth into measurable asset returns.
- iv. Although ATM transaction values showed limited statistical impact, banks should optimize ATM locations and functionality, reduce downtime, and incorporate cross-selling opportunities to enhance ROA indirectly.
- v. Banks should develop innovative internet banking products and services, such as bundled digital solutions, cross-platform integration, and personalized services, to convert online banking activities into tangible improvements in asset utilization and returns.

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