Financial Innovation and Financial Performance of Nigerian Listed Deposit Money Banks: Evidence from Panel Data Modeling

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Abstract: *This study examined the impact of financial innovation on the financial performance of Deposit Money Banks (DMBs) in Nigeria, utilizing secondary data from 2008 to 2023. This data was sourced from the banks' annual financial statements and the Nigerian Exchange Group Factbook. Nine banks with international authorization were purposively selected for the study. Financial innovations in the banking sector include automated teller machines (ATMs), point of sale (POS) terminals, internet banking (WEB), and mobile money payments (MOB) transactions, while return on assets (ROA) and return on equity (ROE) were used as measures of bank financial performance. Panel data models were designed and estimated using the Feasible Generalized Least Squares (FGLS) regression technique. The findings indicated that financial innovations positively influenced the banks' financial performance. However, while ATM and POS transactions significantly impacted the banks' ROA and ROE, WEB and MOB transactions had no significant impact on the financial performance of the deposit money banks.*

Keywords: financial innovation, return on asset, return on equity, deposit money banks, panel data modeling, Nigeria

INTRODUCTION

The Nigerian financial sector has undergone significant dynamism over time. Numerous changes have been adopted, leading to the expansion of financial transactions, activities,

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and organizational structures, which have improved and increased the efficiency of the financial system. Advances in technology and evolving economic conditions have driven this transformation (Loaba, 2022; Mgbada et al., 2024). Technology supports the creation and valuation of new financial instruments and assists in identifying, measuring, and monitoring risks within portfolios that contain complex assets (Olorunleke & Akinyele, 2010; Gambo, 2020; Ibe & Obialor, 2022). Financial innovation, supported by advanced technology, has been a major driver of the transformation in financial sectors globally.

Financial innovation refers to the development and adoption of new financial products, services, technologies, or processes that improve or transform the way financial transactions and services are conducted. According to the European Commercial Bank (ECB, 2003), "financial innovation is primarily a product and organizational innovation, which allows cost or risk reduction for banks and/or a service improvement for the financial industry as a whole". Financial innovations provide more affordable and accessible services to the financial system, enhancing the value of services and products over time (Kamau & Oluoch, 2016; Adil et al., 2020). Financial innovations have been employed by banks as powerful strategic tools to drive competition, thereby serving as an effective means for banks to enhance their performance while maintaining their effectiveness in the market (Chipeta & Muthinja, 2018; Ahmed & Wamugo, 2018; Zu et al., 2019).

Automated Teller Machines (ATMs), Point of Sale (POS) systems, Internet Banking, Nigeria Inter-Bank Settlement System (NIBSS) instant payments, National Electronic Funds Transfer (NEFT), and mobile banking transactions are common examples of financial innovations in the banking industry. The benefits of these modern financial innovations include enhancing competitive advantages, lowering insolvency costs, minimizing default risks, reducing regulatory expenses, increasing transparency, and offering better customization (Gorton & Metrick, 2010; Ashiru et al., 2023; Okeke & Ezeala, 2023; Jote, 2023). Nigerian banks are now emphasizing innovation and marketing by developing new services, employing creative marketing techniques, and finding new ways to deliver banking services efficiently and sustainably.

Financial innovations have contributed remarkably to financial inclusion in Nigeria. The volume of ATM transactions grew from 375,487,756 in 2012 to 839,819,922 in 2019, while mobile phone banking transactions increased from 2,297,688 in 2012 to 377,266,208 in 2019 (CBN, 2021). Also, POS transactions surged from ₦48.01 billion in 2012 to ₦3.2 trillion in 2019, and electronic transfers rose from ₦3.8 trillion in 2012 to ₦3,204.75 trillion in 2019, according to data from the NIBSS database (Ashiru et al., 2023). Hence, financial innovation has made it possible for individuals and businesses to gain access to affordable, reliable, and appropriate financial products and services.

Studies (Nkem & Akujinma, 2017; Orji et al., 2018; Gambo, 2020; Akani & Tony-Obiosa, 2020; Ibekwe, 2021; Osakwe & Ezeaku, 2022; Ibe & Obialor, 2022; Ashiru et al., 2023; Okeke & Ezeala, 2023; Mgbada et al., 2024) have clearly shown that financial innovations

impact the financial performance of Nigerian deposit money banks. However, most of these studies relied on time series data, which fails to account for the heterogenetic nature of the banks and is limited to data from a single entity over time. This limitation can lead to less robust estimates and higher variability in results. Therefore, there is a need to provide more robust findings through panel data estimation. Panel data offers information on multiple entities across several time periods, allowing for a more comprehensive analysis of both cross-sectional and time variations. This can reveal patterns and causal relationships that might not be apparent in time series data alone (Wooldridge, 2010). This study, thus, investigated the impact of financial innovation on the financial performance of deposit money banks in Nigeria using panel data.

The specific objectives of this study were to examine the impact of financial innovation on the return on asset (ROA) and the return on equity (ROE) of deposit money banks in Nigeria. ROA and ROE are proxies of bank financial performance. This led to the formulation and testing of the following hypotheses:

H_1: Financial innovations have significant impact on return on asset of Nigerian deposit money banks.

H_2: Financial innovations have significant impact on return on equity of Nigerian deposit money banks.

LITERATURE REVIEW

Financial Innovation

Innovation refers to the process of implementing new combinations of resources that lead to the creation of new products or services, the opening of new markets, or the establishment of new organizational structures (Schumpeter, 1934). It can also be defined as the "implementation of a new or significantly improved product (good or service), process, marketing method, or organisational method in business practices, workplace organisation, or external relations" (OECD, 2005). These definitions highlight the diverse areas where innovation can occur (product, process, market and organisation).

Financial innovation, on the other hand, refers to the creation and application of novel financial instruments, technologies, and processes which improve the efficiency, accessibility, and functionality of financial markets and services (Mabrouk, & Mamoghli, 2010; Zu et al., 2019; Mensah et al., 2019; Ibekwe, 2021). It can be seen as the process of designing, developing, and implementing new financial instruments and procedures, as well as devising creative solutions to financial challenges (Kamau & Oluoch, 2016; Akani & Tony-Obiosa, 2020). Ajide (2016) describes financial innovation as the development of new financial instruments, services, or practices such as creating new uses for funds, discovering new sources of funding, implementing new processes or techniques for daily operations, or reorganizing aspects of existing financial institutions and channels.

Financial Innovation Types

Over the years, financial innovations have developed widely, encompassing new production processes, new products and services, and new organizational structures.

Financial Process Innovation: This aims to improve the organizational structure and service delivery methods of financial institutions. This innovation is commonly connected with technological advancements, including the use of data mining techniques by financial institutions to identify customers with good creditworthiness (Batiz-Lazo & Woldesenbet, 2006; Rukiya, 2018). Forms of financial process innovation include electronic fund transfer (e.g. credit card, and Fedwire) and real-time gross settlement systems (e.g. instant payment transactions).

Financial Product Innovation: It refers to newly introduced or significantly improved financial services that are either entirely new to the market or distinctly different from existing services. Financial product innovations are often introduced to better cater to the needs of the target clientele, improve operational efficiency, or expand the institution's market presence and outreach (Batiz-Lazo & Woldesenbet, 2006; Adil et al., 2020; Rukiya, 2018). ATM and POS terminals are forms of financial product innovation.

Financial Organisational Innovation: This refers to modifications in the structure, organisation, and legal form of financial institutions. These innovations may be driven or enabled by changes in the financial system. Financial organisational innovations often aim to overcome legal and economic constraints, thereby extending financial services to additional market segments, such as the rural poor (Akhisar et al., 2015; Rukiya, 2018). Online banking and mobile banking are forms of financial organisational innovation.

Bank Financial Performance

Bank performance typically indicates how well a bank has achieved its objectives over a trading period. The primary document that reflects this performance is the published financial statements (Ibekwe, 2021). Financial performance, in a broader sense, refers to the extent to which financial obligations have been met. It serves as a method of evaluating a bank's monetary policies and operations. It is utilized to evaluate a bank's financial health over time and to compare it with similar banks in the banking industry as well as with different sectors of the economy (Huselid et al., 1997; De Young et al., 2007).

Typically, stock prices and their behavior are considered indicators of a firm's performance. However, they may not always be reliable. In contrast, a bank's size, deposit volume, and profitability are often seen as more dependable performance metrics. For this study, profitability indicators such as Return on Assets and Return on Equity are used to evaluate bank performance.

Return on Assets (ROA): ROA shows the percentage of how profitable the assets of a bank are to generate revenue. ROA is obtained when the net income of the bank is divided by

the average total assets of the bank. This indicates how effectively the bank uses its assets to generate earnings, or how many dollars of profit are produced for each dollar of assets managed (Akhisar et al., 2015; Zutter & Smart, 2022). Essentially, ROA answers the question, "What can you accomplish with the assets you have?" A higher ROA signifies better management, and a ROA above 5% is generally considered good.

Return on Equity (ROE): ROE measures the profitability generated from shareholders' equity. It evaluates how effectively a bank uses its equity to produce profits, with equity defined as net assets (assets minus liabilities). ROE reflects the bank's ability to generate revenue growth from shareholder investments (Akhisar et al., 2015; Zutter & Smart, 2022). A ROE of 15-20% is generally viewed as favorable. It is calculated by dividing the net income for the fiscal year (after preferred share dividends but before common share dividends) by the total equity (excluding preference shares) and expressing it as a percentage.

Theoretical Review

This subsection explored various theories that offered insights into financial innovation in the banking industry. The study specifically examined the Diffusion of Innovation (DOI) Theory and Technology Acceptance Model (TAM).

Diffusion of Innovation (DOI) Theory: The theory was developed by an American sociologist, Everett Rogers, in 1962 in his book titled, "Diffusion of Innovations". The theory describes how, why, and at what rate new ideas, concepts, and technologies spread among individuals or groups. It offers a framework that explains how innovations are adopted to become widespread and the factors that influence the adoption process.

The theory highlights five main factors that influence innovation adoption such as relative advantage (how much a technology improves on existing tools), compatibility (its alignment with adopter's needs and values), complexity (extent of ease of use or learning), trialability (the ability to try an innovation before committing to it), and observability (the ability to see its results) (Rogers, 2003).

Considering the dynamic nature of customer demands and the need for fast service delivery in the banking sector, DOI theory helps to explain the widespread adoption of financial innovation such as ATM, POS terminals, mobile banking, and electronic money transfers within the sector. ATM and POS conveniently dispense cash at any time of day; electronic money transfers enable clients to conduct transactions without physically visiting a bank, while mobile banking leverages telecommunications technology to facilitate quick and convenient banking services.

Technology Acceptance Model (TAM): This model was proposed by Fred Davis in 1989. The model explains how users come to accept and use a new technology. The theory provides a framework to address the factors that influence the adoption of information

technology. The model argues that user acceptance of a technology is determined by perceived ease of use (less effort to use the technology), perceived usefulness (extent to which the technology enhances productivity), intention to use (desire to use the technology), and actual use (usage of the technology) (Davis, 1989).

Perceived ease of use is assessed based on whether the technology is easy to learn, understandable and clear, simple to become proficient in, easy to remember, and controllable, while perceived usefulness is measured based on faster work completion, improved job performance, increased productivity, usefulness, and effectiveness. The model posited that customers' intention towards new technology is influenced by perceived ease of use and perceived usefulness. Actual usage is influenced by behavioral intention and is the ultimate measure of technology acceptance.

TAM helps to explain the reason for the adoption and widespread of financial innovations such as ATM, POS terminals, mobile banking, and electronic money transfers. These technologies are accepted and used by the banks and their customers because of their perceived ease of use and perceived usefulness. Through these technologies, banks today are far productivity than years back. Besides, customers are very much satisfied with the fast service delivery of the banks as well as speedy financial transactions without physically appearing in the banks.

Review of Empirical Studies in Nigeria

This paper focused on empirical studies conducted in Nigeria to determine the extent of research done on this topic within the country and to review the methodologies that have been employed to date (see Table 1).

Gaps in Knowledge

From the previous empirical studies conducted in commercial or deposit money banks in Nigeria, it is clear that all the studies employed time series data except Akani and Tony-Obiosa, (2020) who employed panel data. Panel data, which combines cross-sectional and time-series data, has several advantages over time series data only. Panel data provides more efficient and robust estimates of the study's parameters, increases variation due to multiple observations, provides more data points or larger sample size, controls for unobserved individual-specific effects that are constant over time (heterogeneity), provides better assessment of causal relationships, reduces multicollinearity issues, facilitates the analysis of dynamics and temporal changes, and allows for a variety of model specifications, including fixed effects and random effects models. This study therefore provided further empirical evidence on the impact of financial innovation on financial performance of deposit money banks in Nigeria using panel data modeling.

Table 1: Empirical Review of Studies in Nigeria

Year	Title	Author(s)	Methodology	Findings
2013	Electronic Banking andBank Performance in Nigeria	Abaenewe, Z. C., Ogbulu, O. M., &Ndugbu, M. O.	Using time series data from 1997 to 2010, the study employed difference between means to analyse pre-and post-adoption of e-banking on bank performance (ROA and ROE)	E-banking had significantly improved the banks' ROE, but not their ROA.
2017	Financial Innovation and Efficiency on the Banking Sub-sector: The Case of Deposit Money Banks and Selected Instruments of Electronic Banking (2006 - 2014)	Nkem, S. I., &Akujinma, F. A.	Using time series data, the study utilised OLS multiple regression analysis to investigate the impact of financial innovation (ATM, POS, WEB, and MOB) on bank efficiency, measured by the efficiency ratio (EFR), while controlling for monetary policy rate and cash reserve ratio.	ATM, POS and MOB transactions had no significant impact on the banks' EFR. However, WEB had a significant positive impact on EFR of the banks.
2018	Electronic Banking Innovations and Selected Banks Performance in Nigeria	Orji, A., Ogbuabor, J. E., Okon, , A. N., & Anthony-Orji, O. I.	Using time series data from 2007 to 2016, the study employed Seemingly Unrelated Regression Equations (SURE) to examine the impact of e-banking innovations (ATM, POS, and MOB) on bank performance (ROA), while controlling for private investment and the inflation rate.	ATM and MOB transactions had significant positive impact on the banks' ROA, while POS had a negative but significant impact on the ROA
2020	Effects of Technology Innovation on Financial Performance of Commercial Banks in Nigeria	Gambo, N.	Using time series data from 2008 to 2019, the study applied OLS multiple regression analysis to investigate the effect of technology innovation (ATM, WEB, and MOB) on bank performance (ROA).	ATM, WEB and MOB transactions had significant positive impact on the banks' ROA
2020	Effects of financial innovations on the profitability of deposit money banks in Nigeria	Akani, H. W., & Tony-Obiosa, R. L.	Using panel data from 2009 to 2017, this study applied Feasible Generalized Least Squares (FGLS) analysis to assess the effect of financial innovation (ATM, EFT, WEB, and MOB) on profitability (ROE), while controlling for investment in technology.	ATM and EFT transactions had negative effect on the banks' ROE, while WEB and MOB had positive effect on the ROE.

2021	Financial Innovation and Performance of Deposit Money Banks in Nigeria	Ibekwe, A. O.	Using time series data, the study utilised OLS regression analysis to examine the effect of financial innovation (ATM, POS, WEB, and MOB) on bank performance (ROA).	ATM, POS, WEB and MOB had significant positive effect on the banks' ROA
2022	The effect of electronic banking on the operations of deposit money banks in Nigeria (2006- 2020)	Osakwe, C. I., &Ezeaku, C. N.	Using time series data, the study applied OLS multiple regression analysis to assess the effect of e-banking (ATM, POS, and MOB) on bank performance (ROA).	ATM transactions had positive and significant effect on the banks' ROA; POS and MOB had negative effect on the ROA
2022	Effect of Financial Innovation on the Performance of Deposit Money Banks in Nigeria.	Ibe, C. C., &Obialor, C. B.-M.	Using time series data from 2009 to 2020, the study employed Error Correction Model to evaluate the effect of financial innovation (ATM, POS, WEB, and MOB) on bank performance (bank deposits).	ATM, WEB and MOB had significant positive effect on the bank deposits, while POS had a negative effect on the deposits.
2023	Financial innovation and bank financial performance: Evidence from Nigerian deposit money banks	Ashiru, O., Balogun, G., &Paseda, O.	Using time series data from 2012 to 2021, the study utlised ARDL analysis to assess the impact of financial innovations (ATM, POS, WEB, MOB, EFT, and NIP) on bank performance (ROA and ROE)	ATM, POS, WEB, and MOB had significant positive impact on the banks' ROA and ROE, while EFT and NIP had adverse impact on the financial performance
2023	The Effect of Financial Innovation on The Performance of Deposit Money Banks in Nigeria	Okeke, I. C., &Ezeala , G.	Using time series data from 2006 to 2020, the study applied OLS multiple regression analysis to evaluate the effect of financial innovation (ATM, POS, and MOB) on bank performance, measured by liquidity ratio (LQR) and loan to deposit ratio (LDR).	While ATM, POS, and MOB transactions positively influenced the bank's LQR, only POS had a significant positive effect on LQR. Also,innovation did not have a significant effect on the banks' LDR.
2024	Effects of Technological Innovations on the Financial Performance of Deposit Money Banks (DMBs) in Nigeria (2010-2021)	Mgbada, F. N., Ele, L. E., Uguru, L. C., & Tebepah, S. F.	Using time series data, the study employed ARDL to analyse the effect of technological innovations (ATM, POS, WEB and MOB) on bank performance (ROA)	While ATM, POS, and MOB transactions had significant positive effect on the bank performance, WEB had a significant negative influence on the performance.

Note: ATM=Automated Teller Machines, POS=Point-of-Sale terminals, WEB=Online/internet Banking,
MOB=Mobile banking, ETF=Electronic Fund Transfer, NIP=NIBSS Instant Payment

METHODOLOGY

Research Design

This study utilized an ex-post facto research design, meaning the events under observation had already occurred, and the researchers had no control over the variables involved but analyze the effects of these variables. This design allowed the researcher to assess the effect of financial innovation on the financial performance of deposit money banks in Nigeria.

Data for the study were sourced from secondary materials, precisely from the publications of Nigerian deposit money banks through their audited annual reports and financial statements covering the years 2008 to 2023. The data collected included: number of ATM, number of POS, value of mobile banking transactions and values of internet (web) banking transactions in Nigeria. The period from 2008 to 2023 was selected due to the rise in financial innovation awareness, right after the banking consolidation in Nigeria.

Population, Sample Size and Sampling Techniques

The population of this study comprises all the thirteen deposit money banks that are listed on the Nigerian Exchange Group (NGX) as at April 26, 2024. Purposive sampling technique was employed to select a sample size of nine deposit money banks which have heavily invested in financial innovation, based on the available information. Besides, these banks have international authorization. The banks are Access Bank Limited, First Bank Nigeria Limited, Zenith Bank Plc, Fidelity Bank Plc, First City Monument Bank Limited, United Bank of Africa Plc, Guaranty Trust Bank Limited, Stanbic IBTC Bank Limited, and Wema Bank Plc.

Measurement of Variables

Table 2 shows the measurement of the variables of the study. The dependent variable of the study is financial performance of deposit money banks which was measured by return on assets and return on equity. Financial innovation is the independent variable which was measured by the number of ATM, number of POS terminals, value of internet banking (WEB) transactions, and value of mobile banking transactions (MOB). The control variable used was the firm size.

Table 2: Summary of Measurement of Variables

Variable	Label	Measurement	Source
Dependent variable			
Return on Assets	ROA	Net income/Total assets	Ashiru, et al. (2023)
Return on equity	ROE	Net income/Total Equity	Ashiru, et al. (2023)
Independent variable			
Automated Teller Machines	ATM	Number of ATM	Akani & Tony-Obiosa (2020)
Point-of-Sales	POS	Number of POS terminals	Akani & Tony-Obiosa (2020)
Internet Banking	WEB	Value of Web transactions	Ibe & Obialor, (2022)
Mobile banking	MOB	Value of Mobile transactions	Ibe & Obialor, (2022)
Control variable			
Firm Size	SIZE	Natural logarithm of total assets	He, Chen & Yu (2019)

Model Specification

The panel regression model employed to investigate the impact of financial innovation on the financial performance of deposit money banks in Nigeria is presented below:

$$ROA_{it} = \beta_0 + \beta_1 ATM_{it} + \beta_2 POS_{it} + \beta_3 WEB_{it} + \beta_4 MOB_{it} + \beta_5 SIZE_{it} + \varepsilon \qquad (1)$$

$$ROE_{it} = \beta_0 + \beta_1 ATM_{it} + \beta_2 POS_{it} + \beta_3 WEB_{it} + \beta_4 MOB_{it} + \beta_5 SIZE_{it} + \varepsilon \qquad (2)$$

Where: ROA = Return on Assets
     ROE = Return on Equity
     ATM = Automated Teller Machines
    POS = Point-of-Sales
    WEB = Internet Banking
    MOB = Mobile Banking
    SIZE = Firm Size
    β_0 = Intercept Coefficient
    β_1 to β_5 = Parameters to be estimated

Apriori expectation: $\beta_1, \beta_2, \beta_3, \beta_4 > 0$

The panel data models (1) and (2) were estimated using the Feasible Generalized Least Squares (FGLS) regression technique.

RESULTS AND FINDINGS

Descriptive Statistics

The descriptive statistics for the variables under study are presented in Table 3. The average ROA was 0.020 which indicates that, on average, the banks generated a return of 2% on their total assets. An average ROA of 2% suggests that the banks were modestly efficient in converting their assets into earnings. The standard deviation was 0.017 which indicates that there was a moderate level of variability in ROA among the banks. The results also showed that the average ROE was 0.117 depicting that, on average, Nigerian deposit money banks (DMBs) achieved 11.7% return on their shareholders' equity. The standard deviation of 0.221 indicates significant variability in ROE among the banks, highlighting a wide range of performance levels in terms of equity returns across the sample. The variability implies that not all banks perform equally. This disparity could be due to differences in the implementation of financial innovations, operational efficiency, market strategies, and risk management practices. Comparing both returns, it is clear that the returns realized by banks on equity are larger than returns on assets.

The average number of ATM and POS were 97.2 billion and 5.7 trillion respectively; and values of transactions for internet (WEB) banking and mobile banking (MOB) were ₦1.44 trillion and ₦147.3 trillion respectively. This data indicates a growing reliance on financial innovations during the period covered. Deposit money banks in the country have increased their use of these financial innovations to better serve their customers. The standard

deviations of 500.9 for ATM, 2.98 for POS, 2.89 for WEB, and 6880 for MOB revealed high variability in MOB and ATM services compared to POS, and WEB. This suggests that MOB and ATM's impacts are more varied and unpredictable among banks, whereas POS and WEB innovations tend to have more stable effects on bank performance. Furthermore, the average firm size (SIZE) of Nigerian deposit money banks was 16.12 with a standard deviation of 2.46 which depict moderate variability in bank sizes. The skewness analysis uncovers varied patterns in the financial characteristics of Nigerian deposit money banks. The ROE distribution is highly left-skewed, indicating that most banks have higher ROE values, but there are a few extremely low values pulling the distribution to the left. WEB distribution was approximately symmetric, signifying that the data was nearly normal with no significant skewness. ROA was slightly right-skewed but nearly symmetric, POS and Firm size showed moderate right-skewness, with POS displaying a more pronounced skew, MOB was slightly right-skewed but remains close to symmetric, and ATM was highly right-skewed, indicating a significant concentration of lower values with some extreme higher values.

Additionally, the kurtosis revealed different levels of peakedness in the distributions of the financial variables. Specifically, ROA had a kurtosis of 7.52, ROE was 27.88, ATM was 18.98, POS was 10.30, WEB was 11.29, and MOB stood at 52.24. These values indicate that the distributions were highly peaked and included significant outliers. The kurtosis of firm size was 2.77, suggesting moderate peakedness. Jarque-Bera evaluates if the variables met the normality assumption. The findings indicated that the p-value for each variable was below 0.05, leading to the rejection of the null hypothesis of normality at the 5% significance level. This implies that the variables did not conform to a normal distribution. Despite these variations, the central limit theorem (CLT) offers a robust solution to address issues related to skewness, peakedness and normality. According to the CLT, as the sample size increases, the distribution of the sample mean approaches a normal distribution, regardless of the underlying distribution of the variable. The theorem indicates that normal distribution concerns are minimal when the sample size exceeds 30 (Anderson et al., 2017). Given that this study includes 144 observations, deviations from normal distribution should not pose a significant issue.

Table 3: Descriptive Statistics

Statistics	ROA	ROE	ATM	POS	WEB	MOB	SIZE
Mean	0.020	0.117	97.224	0.574	0.204	147.307	16.120
Maximum	0.094	0.350	3111.0	11.40	12.29	40001.2	21.82
Minimum	-0.050	-1.26	-1891.0	-11.22	-13.23	-56864.7	13.09
Std. Dev.	0.017	0.221	500.96	2.98	2.89	6880.0	2.462
Skewness	0.317	-4.720	2.641	0.910	-0.70	-2.949	1.134
Kurtosis	7.52	27.88	18.98	10.30	11.29	52.24	2.78
Jarque-Bera	100.7	3425.1	1368.9	273.26	341.74	11886.3	25.12
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum	2.304	13.52	11278	66.56	-23.62	17087.6	1869.9
Observations	144	144	144	144	144	144	144

Multicollinearity Test

Multicollinearity occurs when independent variables in a regression model are not independent but rather highly correlated with each other. This makes it difficult to assess the individual effect of each variable on the dependent variable. The multicollinearity analysis, summarized in Table 4, examines the relationships between bank performance, measured by ROE (Return on Equity) and ROA (Return on Assets), and various financial innovation variables used for the study. The findings revealed generally positive but weak correlations between the financial innovations and bank performance. Also, the correlation between the variables of financial innovation was found to be weak. In the same vein, the relationship between firm size and financial innovations was positively weak. The multicollinearity test conducted showed that all correlation values were below 0.8, which indicated that there was no issue of multicollinearity among the study variables.

Table 4: Multicollinearity Test Matrix

	ROE	ROA	MOB	POS	SIZE	WEB	ATM
ROE	1.000						
ROA	0.379	1.000					
MOB	0.023	-0.036	1.000				
POS	0.047	0.054	-0.004	1.000			
SIZE	0.321	0.334	0.017	0.044	1.000		
WEB	0.011	0.010	0.015	0.653	0.056	1.000	
ATM	0.034	0.013	0.002	0.082	0.107	0.015	1.000

Cross-Sectional Dependence Test

Cross-sectional dependence test assesses whether there are correlations between the cross-sectional units of a dataset at a given point in time. This is particularly relevant in panel data analysis, where multiple cross-sectional units are involved. Cross-sectional dependence was examined to determine whether there was interdependence among the units within the same cross-section. If such dependence is present, it suggests that there may be unobserved effects influencing all units either similarly or differently. The Pesaran CD test in Table 5 is utilized to assess the cross-sectional data.

The null hypothesis of the Pesaran CD test indicates that there is no cross-sectional dependence in the dataset. However, our results, with a p-value less than 0.05, suggest that cross-sectional dependence is present, indicating the influence of some unobserved heterogeneity among the units. Consequently, the data lacks pool ability, making either a fixed effects model or a random effects model suitable for analysis.

Table 5: Pesaran CD Test

Breusch-Pagan Lagrange Multiplier Test Summary	Chi-square Coefficient	Probability	Null Hypothesis: There is no cross-sectional dependence inthe unit variables
VDS	74.48994	0.0002	Rejection of Null

*Note: * represents significant at a 5% level*

Unit Root Test

The variables of financial innovation (ATM, POS, WEB and MOB) and financial performance (ROA and ROE) were subjected to unit root test using Levin-Lin-Chu method. The essence of the test was to determine the stationarity of the variables in the models. Stationary series are necessary to avoid spurious regression results and to accurately interpret the relationships between variables. This establishes the confidence in the reliability of the models. The analysis in Table 6 shows the unit root tests for stationarity of the data series. The analysis showed that all variables have their p-values less than 5% level of significance. This revealed that the data series or variables were stationary at level I(0) - integrated of order 0.Stationarity I(0) refers to a series that is stationary without requiring any differencing. It indicates that the series has a constant mean, variance, and autocorrelation structure over time, making it suitable for many types of statistical analysis and modeling. Hence, the null hypothesis that the data series have unit root was rejected.

Table 6: Levin Chin-Chu Unit Root Test

Variables	t-stat	p-value	Order	State
ROE	-8.63715	0.000	I(0)	Level
ROA	-11.5753	0.000	I(0)	Level
POS	-10.9556	0.000	I(0)	Level
MOB	-4.31759	0.000	I(0)	Level
ATM	-5.79923	0.000	I(0)	Level
WEB	-9.02846	0.000	I(0)	Level
SIZE	-4.73779	0.000	I(0)	Level

Impact of Financial Innovation on Return on Assets (ROA) of Deposit Money Banks

The Heteroscedasticity LR test was conducted and the test yielded p-values greater than 0.05, indicating that we fail to reject the null hypothesis of homoscedasticity. This suggests that the variance of the error terms remains consistent across different levels of the independent variables, which include ATM, POS, WEB, and MOB. As a result, the assumption of homoscedasticity is upheld, implying that the model's residuals do not exhibit significant heteroscedasticity. This ensures that the standard errors are likely reliable, making the OLS estimates efficient and unbiased, thereby supporting the validity

of the regression analysis. Consequently, the estimated impact of the financial innovations on bank financial performance (ROA and ROE) was considered robust within this analytical framework.

The analysis in Table 7 presents the regression results of pooled, fixed effects, and random effects models examining the impact of financial innovation on financial performance, as measured by ROA. The pooled regression model was deemed inappropriate because of unobserved individual-specific factors that might affect the dependent variable and vary across individual banks. A Hausman test was conducted to choose between the fixed effects model and the random effects model, with the null hypothesis stating that the random effect model is preferable to the fixed effect model. The Hausman test yielded a p-value of 0.0203, which indicated the rejection of the null hypothesis. Consequently, the random effects model was rejected in favor of the fixed effects model.

Analyzing the fixed effects model, the results showed that ATM ($t = 1.675$, $p < 0.1$) and POS ($t = 1.977$, $p < 0.05$) had a significant positive impact on the ROA of deposit money banks, while WEB and MOB transactions had a positive but not significant impact on the banks' ROA. This implies that a unit increase in ATM deployment resulted in a marginal increase of 0.00028 percentage in the banks' ROA. Similarly, a unit increase in POS transactions led to a marginal increase of 0.0426 percentage in the banks' ROA. Although WEB and MOB transactions had a positive influence on the ROA of deposit money banks, this effect was not statistically significant. Firm size was also found to have a positive influence on the bank's ROA.

Furthermore, the combined impact of financial innovations on the banks' ROA was significantly positive ($F = 17.712$, $p < 0.01$). The coefficient of determination (R^2) confirmed that financial innovations had a positive effect on bank performance, as they explained a substantial proportion (69.3%) of the variation in the ROA of deposit money banks. The Durbin-Watson statistic, which is approximately 2.0, indicates that the regression estimates are reliable and not biased due to autocorrelation. Therefore, the hypothesis (H_1) was supported, demonstrating that financial innovations have a significant positive impact on the ROA of deposit money banks in Nigeria.

Impact of Financial Innovation on Return on Equity (ROE) of Deposit Money Banks

Table 8 presents the regression results for the impact of financial innovation on financial performance, measured by ROE, using pooled, fixed effects, and random effects models. The pooled regression model was unsuitable because of the individual-specific effects of the banks that need to be controlled. A Hausman test was performed to determine whether to use the fixed effects or random effects model, with the null hypothesis stating that the random effects model is preferable. The Hausman test yielded a p-value of 0.0001, leading to the rejection of the null hypothesis. Consequently, the fixed effect model is favored over the random effect model.

Table 7: **Regression Result of Effect of financial innovation on ROA of Deposit Money Banks**

Predictor	Fixed Effect Model	Random Effect Model	Pooled Model
Constant	0.001293 (0.078057) *0.9379*	0.022292 (0.878896) *0.3814*	0.057226 (5.673973) *0.000*
ATM	0.00000284 (1.675039)* *0.097*	0.00000352 (1.080505) *0.2823*	0.00000324 (0.81117) *0.419*
POS	0.000426 (1.977089)** *0.0499*	0.000692 (1.26469) *0.2087*	0.000591 (0.879013) *0.3813*
WEB	0.0000574 (0.275387) *0.7836*	0.000146 (0.341507) *0.7334*	0.000177 (0.335319) *0.738*
MOB	0.000000119 (0.90221) *0.3691*	0.000000116 (0.65354) *0.5148*	0.0000000969 (0.441148) *0.660*
SIZE	0.001154 (1.12405) *0.2636*	0.00015 (0.096945) *0.9229*	0.002321 (3.755308)*** *0.0003*
R^2	0.693002	0.020441	0.120428
Adjusted R^2	0.653875	0.024085	0.080448
F statistic	17.71152***	0.459078	3.012178
Prob (F statistic)	0.000	0.805895	0.013786
Durbin-Watson Stat	1.809169	1.726842	1.099273
Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.868345	5	0.0203

*Note: *, ** and ***indicate significance at the 10%, 5% and 1% respectively. Values in bracket represent t-statistic and values in italics represent probability values*

Analysis using the fixed effect model revealed that ATM transactions (t = 2.537, p < 0.05) and POS transactions (t = 2.648, p < 0.01) had a significant positive effect on the ROE of the deposit money banks. In contrast, WEB and MOB transactions showed a positive but statistically insignificant effect on the banks' ROE. Specifically, each additional unit of ATM deployment resulted in a marginal increase of 0.00384 percent in the banks' ROE, while each additional unit of POS transactions led to a marginal increase of 0.94 percent in ROE. Although WEB and MOB transactions also had a positive effect on ROE, their impact was less substantial. Furthermore, the firm size significantly and positively influenced the DMBs' ROE.

More so, the combined impact of financial innovations on the ROE of the sample banks was significantly positive (F = 11.656, p < 0.01). The coefficient of determination (R²) confirmed that the financial innovations had a substantial positive impact on the banks'

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ROE, accounting for 59.8% of the variation in ROE among deposit money banks. The Durbin-Watson statistic, which is approximately 2.0, suggests that the regression estimates are reliable and not affected by autocorrelation. Consequently, the second hypothesis (H_2) was achieved that financial innovations have significant positive impact on the return on equity (ROE) of deposit money banks in Nigeria.

Table 8:Regression Results on Effect of Financial Innovations on ROE of Deposit Money Banks

Predictor	Fixed Effect Model	RandomEffect Model	Pooled Model
Constant	0.708146 (4.435482) *0.0000*	0.312939 (1.567488) *0.1199*	0.591691 (4.454534) *0.0000*
ATM	0.0000384 (2.536999)** *0.0127*	0.0000353 (0.793847) *0.429*	0.0000236 (0.449685) *0.6538*
POS	0.006799 (2.647919)*** *0.0094*	0.00805 (1.076763) *0.2839*	0.00543 (0.613528) *0.5408*
WEB	0.000975 (0.483287) *0.6299*	0.005502 (0.940183) *0.3492*	0.005672 (0.816401) *0.416*
MOB	0.00000104 (1.251256) *0.2137*	0.00000094 (0.386996) *0.6995*	0.000000872 (0.301605) *0.7635*
SIZE	0.051145 (5.163982)*** *0.0000*	0.012287 (1.004142) *0.3175*	0.029591 (3.635783)*** *0.0004*
R^2	0.597683	0.02194	0.111578
Adjusted R^2	0.546408	0.022518	0.071195
F statistic	11.65627***	0.493499	2.763006
Prob (F statistic)	0.0000	0.780515	0.021673
Durbin-Watson Stat	1.603951	0.590944	0.498884
Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	26.37667	5	0.0001

*Note: *, ** and ***indicate significance at the 10%, 5% and 1% respectively. Values in bracket represent t-statistics and values in italics represent probability values*

DISCUSSION OF FINDINGS

The findings of this study revealed that ATM, POS, WEB, and MOB transactions have a significant positive impact on the financial performance (ROA and ROE) of deposit money banks in Nigeria. This is consistent with the studies by Siam (2006), Aduda and Kingoo (2012), Akhisar et al. (2015), Orji et al. (2018), Akani and Tony-Obiosa (2020), Ibekwe (2021), and Ashiru et al. (2023), which found that financial innovations have a significant

positive effect on the financial performance of commercial banks. This suggests that bank customers prefer electronic transaction methods offered by deposit money banks over traditional transaction methods, due to the greater ease of use, convenience, and accessibility provided by these financial innovations (Karim & Hamdan, 2010; Kathuo et al., 2015; Kamau & Oluoch, 2016).

The findings also revealed that ATM and POS transactions significantly impact both the ROA and ROE of the deposit money banks, while WEB and MOB transactions do not significantly affect the banks' financial performance. It is clear from both performance measures that financial product innovations have a more substantial effect on bank performance compared to other types of financial innovations, such as internet banking and mobile banking. This may be because many bank customers in Nigeria prefer using ATM and POS systems for their transactions due to concerns about security and cyber fraud associated with internet banking (WEB) and mobile banking (MOB) systems. These results align with Sathye (2005) and Hernando and Nieto (2007), which found that financial innovations like mobile banking and internet banking had no significant impact on bank performance.

IMPLICATION TO RESEARCH AND PRACTICE

This study contributes to the existing body of knowledge by providing additional empirical evidence on the impact of financial innovation on the financial performance of deposit money banks through the use of panel data estimation. Specifically, the analysis explores the effects of financial innovations, including Automated Teller Machines (ATMs), Point of Sale (POS) systems, Internet Banking (WEB), and Mobile Banking (MOB), on the return on assets (ROA) and return on equity (ROE) of deposit money banks. The study reveals that financial innovations are becoming increasingly prevalent, especially with the saga of redesign of the naira which brought about scarcity of naira notes (Monye, 2024). Nigerian deposit money banks and their customers are effectively leveraging these innovations to improve transaction efficiency, service delivery, and overall profitability. Therefore, deposit money banks should implement more electronic-based applications products.

CONCLUSION

This study indicates that ATM and POS systems have significant positive impact on the bank performance, measured by ROA and ROE, while WEB and MOB have positive but not significant impact on the performance. This implies that financial product innovations like ATM and POS have substantial impact on DMBs' profitability. Besides, the combined impact of the financial innovations (ATM, POS, WEB and MOB) on the banks' financial performance was found to be significantly positive at 0.01 percent. This means that the financial innovations have a very strong and statistically significant positive effect on

banks' financial performance, with a very low probability that this effect is due to random chance. Therefore, to further enhance their performance and the quality of services provided to customers, deposit money banks should continue to implement more financial innovations and address security concerns effectively.

REFERENCES

Abaenewe, Z. C., Ogbulu, O. M., & Ndugbu, M. O. (2013). Electronic Banking and Bank Performance in Nigeria. *West African Journal of Industrial & Academic Research, 6*(1), 171-187. Retrieved from https://www.ajol.info/index.php/wajiar/article/view/87447

Addae-Korankye,, A. (2014). The impact of E-banking on customer services and the profitability of banks in Ghana. *Global Journal of Commerce and Management Perspective., 3*(1), 61-65. Retrieved from https://www.longdom.org/articles-pdfs/the-impact-of-ebanking-on-customer-service-and-profitability-of-banks-in-ghana.pdf

Adil, M. H., Hatekar, N., & Sahoo, P. (2020). The Impact of Financial Innovation on the Money Demand Function: An Empirical Verification in India. *Margin: The Journal of Applied Economic Research, 14*(1), 28–61. https://doi.org/10.1177/0973801019886479

Aduda, J., & Kingoo, N. (2012). The relationship between electronic banking and financial performance among commercial banks in Kenya. *journal of Finance and Investment Analysis, 1*(3), 99-118. Retrieved from http://www.scienpress.com/Upload/JFIA%2fVol%201_3_6.pdf

Ahmad, A., Muhammad, B., & Sultan, M. (2010). Impact of customer satisfaction on performance of commercial banks in Pakistan. *Interdisciplinary Journal of Contemporary Research in Business, 2*(8), 316-322. Retrieved from https://www.researchgate.net/publication/264834243_Impact_of_Customer_Satisfaction_on_Performance_of_Conventional_Banks_in_Pakistan

Ahmed, O. N., & Wamugo, L. (2018). Financial Innovation and the Performance of Commercial Banks in Kenya. *International Journal of Current Aspects in Finance, IV*(II), 134. https://doi.org/10.37745/ejaafr.2013

Ajide , F. M. (2016). Financial innovation and sustainable development in selected countries in West Africa. *Journal of Entrepreneurship, Management and Innovation, 12*(3), 85-111. Retrieved from http://www.jemi.edu.pl/uploadedFiles/file/all-issues/vol12/issue3/JEMI_Vol12_Issue3_2016_Article4.pdf

Akani, H. W., & Tony-Obiosa, R. L. (2020). Effects of financial innovations on the profitability of deposit money banks in Nigeria. *European Journal of Accounting, Auditing and Finance Research, 8*(1), 53-73. Retrieved from https://www.researchgate.net/publication/359217073_Effects_Of_Financial_Innovations_On_The_Profitability_Of_Deposit_Money_Banks_In_Nigeria

Akhisar, I., Tunay, K. B., & Tunay, N. (2015). The Effects of Innovations on Bank Performance: The Case of Electronic Banking Services. *Procedia - Social and Behavioral Sciences,195*(1), 369–375. https://doi.org/10.1016/j.sbspro.2015.06.336

Al-Adwan, M. M., Al-Zyood, M., Ishtaq, M., & Arabia, S. (2013). The impact of electronic payment on Saudi Banks profitability: A case study of Sadad payment system. *IJRRAS, 14*(1). Retrieved from https://wwwsemanticscholar.org/paper/THEIMPACT-PAYMENT-OFa7118ef8751664bde231e4802cd57eb7a6ace430

Anderson, D. R., Sweeney, D. J., Williams, T. A., Camm, J. D., & Cochran, J. J. (2017). *Statistics for Business and Economics* (13th ed.). Boston: Cengage Learning. Retrieved from http://lib.ysu.am/disciplines_bk/efbc179b18dd97d124c6ccd17bd58d28.pdf

Publication of the European Centre for Research Training and Development-UK

Ashiru, O., Balogun, G., & Paseda, O. (2023). Financial innovation and bank financial performance: Evidence from Nigerian deposit money banks. *Research in Globalization*, 2-7. https://doi.org/10.1016/j.resglo.2023.100120

Batiz-Lazo, B., & Woldesenbet, K. (2006). The dynamics of product and process innovation in UK banking. *International Journal of Financial Services Management, 1*(4), 400-421. https://doi.org/10.1504/IJFSM.2006.010120

CBN. (2021). *Statistical bulletin payment system statistics.* Retrieved from https://www.cbn.gov.ng/documents/Statbulletin.asp

Chipeta, C., & Muthinja, M. M. (2018). Financial Innovations and Bank Performance in Kenya: Evidence from Branchless Banking Models. *South African Journal of Economic and Management Sciences, 21*(1), 1–11. Retrieved from https://hdl.handle.net/10520/EJC-12216e1200

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340. https://doi.org/10.2307/249008

De Young, R., Lang, W. W., & Nolle, D. L. (2007). How the Internet affects output and performance at community banks. *Journal of Banking & Finance, 31*(4), 1033-1060. https://doi.org/10.1016/j.jbankfin.2006.10.003

ECB. (2003). Structural change and growth prospects in Asia: Challenges to central banking. Speech by Solans E. D., Member of the governing council and of the executive board of the European Central Bank, at the 38th SEACEN governors' conference and 22nd meeting of the SEACEN board of governors, Manila, Philippines. Retrieved from http://www.ecb.europa.eu/press/key/date/2003/html/sp030213.en.html

Rogers, E. M. (1962). *Diffusion of Innovations*. New York: Free Press of Glencoe.

Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). New York: Free Press of Glencoe.

Gambo, N. (2020). Effects Of Technology Innovation On Financial Performance Of Commercial Banks In Nigeria. *Journal of Management Science & Entrepreneurship, 15*(7), 522-523. Retrieved from https://www.hummingbirdpubng.com/wp-content/uploads/2020/10/Effects-of-Technology-Innovation-on-Financial-Performance-of-Commercial-Banks-.pdf

Gorton, G., & Metrick, A. (2010). Securitized banking and the run on repo. *Yale school of management, Working Paper*. Retrieved from https://ssrn.com/abstract=1440752

Hernando, I., & Nieto, M. J. (2007). Is the internet delivery channel changing banks' performance? The case of Spanish banks. *Journal of Banking and Finance, 31*, 1083-1099. https://doi.org/10.1016/j.jbankfin.2006.10.011

Hossein, S. M. (2013). Consideration of the effect of E-banking on banks profitability: A case study of selected Asian Countries. *Journal of Economics and Sustainability Development, 4*(11), 112-117. Retrieved from https://www.iiste.org/Journals/index.php/JEDS/article/view/6851/6959

Huselid , M. A., Jackson, S. E., & Schuler, R. S. (1997). Technical and Strategic Human Resource management Effectiveness as Determinants of firm performance. *Academy of mamngement journal, 40*(1), 171-188. https://doi.org/10.2307/257025

Ibe, C. C., & Obialor, C. B.-M. (2022). Effect of Financial Innovation on the Performance of Deposit Money Banks in Nigeria. *International Journal of Trend in Scientific Research and Development (IJTSRD), 6*(6), 1241. Retrieved from https://www.researchgate.net/publication/364060550_Effect_of_Financial_Innovation_on_the_Performance_of_Deposit_Money_Banks_in_Nigeria

Ibekwe, A. O. (2021). Financial Innovation and Performance of Deposit Money Banks in Nigeria. *International Journal of Business & Law Research, 9*(1), 162-173. https://doi.org/10.56201/ijbfr.v8.no2.2022.

Nkem, S. I., & Akujinma, F. A. (2017). Financial innovation and efficiency on the banking sub-sector: the case of deposit money banks and selected instruments of electronic banking (2006 - 2014). *Asian*

Journal of Economics, Business and Accounting, 2(1), 1-12. https://doi.org/10.9734/AJEBA/2017/29981

Kamau, D. M., & Oluoch, J. (2016). Relationship between financial innovation and commercial banks performance in Kenya. *International Journal of Social Sciences and Information Technology, 2*(4), 34-47. Retrieved from https://www.ijssit.com/main/wp-content/uploads/2016/06/relationship-between-financial-innovation-and-commercial-bank-performance-in-kenya.pdf

Karim, A. J., & Hamdan, A. M. (2010). The impact of internet technology on improving bank performance matrix: Jordanian banks as a case study. *European, Mediterranean and Middle Eastern Conference on Information Systems*, 1-15. https://doi.org/10.59759/business.v1i4.458

Kathuo, S., Rotich, G., & Anyango, W. (2015). Effect of mobile banking on the financial performance of bank institutions in Kenya. *The Strategic Journals of Business and Change Management, 2*(98), 1440-1457. Retrieved from https://www.strategicjournals.com/index.php/journal/article

Loaba, S. (2022). The impact of mobile banking services on saving behavior in West Africa. *Global Finance Journal*, 53, Article 100620. https://doi.org/10.1016/j. gfj.2021.100620

Mabrouk, A., & Mamoghli, C. (2010). Dynamic of Financial Innovation and Performance of Banking Firms: Context of an Emerging Banking Industry. *International Research Journal of Finance and Economics, 5*(6), 20-26. Retrieved from https://www.researchgate.net/publication/286344704_Dynamic_of_financial_innovation_and_performance_of_banking_firms_Context_of_an_emerging_banking_industry

Mensah, M. A., Omenonye, A., Brafu-Insaaidu, W. G., & Yan, L. (2019). Financial Innovations and Financial Performance: Perceptions of Commercial Bank Executives. *North American Academic Research, 2*(12), 1–35. https://doi.org/10.5281/zenodo.3564931

Mgbada, F. N., Ele, L. E., Uguru, L. C., &Tebepah, S. F. (2024). Effects of Technological Innovations on the Financial Performance of Deposit Money Banks (DMBs) in Nigeria 2010-2021. *International Journal of Economics and Business Management, 10*(3), 64-79. https://doi.org/10.56201/item.v10.no3.2024

Monye, E. (2024). *Why Nigeria's controversial naira redesign policy hasn't met its objectives* (Working Paper). Carnegie Endowment for International Peace. Retrieved from https://carnegie-production-assets.s3.amazonaws.com/static/files/Monye_Nigeria_FINAL.pdf

OECD (2005). *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*. OECD Publishing.

Okeke, I. C., & Ezeala , G. (2023). The Effect Of Financial Innovation On The Performance Of Deposit Money Banks In Nigeria. *African Banking and Finance Review Journal (ABFRJ), 1*(1), 116-130. Retrieved from www.abfrjournal.com

Olorunleke, K., & Akinyele , S. T. (2010). Technology and service quality in the banking industry: An empirical study of various banking institutions in Nigeria. *Journal of Economics and International Finance, 2*(12), 279-290. https://doi.org/10.3923/ibm.2010.209.221

Orji, A., Ogbuabor, J. E., Okon, , A. N., & Anthony-Orji, O. I. (2018). Electronic Banking Innovations and Selected Banks Performance in Nigeria. *The Economic and Finance Letters, 5*(2), 46–57. https://doi.org/10.18488/journal.29.2018.52.46.57

Osakwe, C. I., & Ezeaku, C. N. (2022). The effect of electronic banking on the operations of deposit money banks in Nigeria (2006- 2020). *International Journal of Trend in Scientific Research and Development, 6*(4), 233-1241. Retrieved from https://www.ijtsrd.com/papers/ijtsrd50220.pdf

Ridwan, D., & Joseph, T. E. (2021). Effect of bank charges on bank customer's savings and income in Nigeria. *Journal of Economics, Management and Trade, 27*(3), 1-11. https://doi.org/10.9734/jemt/2021/v27i330331

Rukiya. (2018). *The effect of financial innovation on the financial performance of commercial banks in Ethiopia.* Addis Ababa University, Department of Accounting and Finance. Retrieved from https://www.academia.edu/85376304/the_impact_of_financial_innovation_on_operational_performance_of_commercial_banks_in_ethiopia

Publication of the European Centre for Research Training and Development-UK

Schumpeter, J. A. (1934). *The Theory of Economic Development*. Harvard University Press.

Siam, A. (2006). Role of the electronic banking services on the profits of Jordanian banks. *American Journal of Applied Sciences, 3*(9), 1999-2004. https://doi.org/10.3844/ajassp.2006.1999.2004

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data* (2nd ed.). Massachusetts: MIT Press. Retrieved from https://lunarintcollege.edu.et/wp-content/uploads/2022/07/Wooldridge-J.M.-Econometric-Analysis-of-Cross-Section-and-Panel-Data-2ed-.pdf

Yasin, M. A. (2018). Impact of Internet Banking on Financial Performance: Empirical Evidence from Commercial Banks of Ethiopia. *Journal of Information Engineering and Applications, 8*(6), 1-8. Retrieved from https://core.ac.uk/download/pdf/234677418.pdf

Zu, J., Gu, Y., Li, K., & Bonsu, O. M. (2019). Impacts of Financial Innovations on Financial Performance: Evidence of Electronic Banking in Africa. *International Journal of Scientific Engineering and Science, 3*(7), 56–60. Retrieved from http://ijses.com/wp-content/uploads/2019/08/67-IJSES-V3N6.pdf

Zutter, C. J., & Smart, S. B. (2022). *Principles of Managerial Finance* (16th ed.). United Kingdom: Pearson Education Limited. Retrieved from https://api.pageplace.de/preview/DT0400.9781292400549_A41609095/preview-9781292400549_A41609095.pdf