THE EEFECT OF FINANCIAL INNOVATIONS ON DEPOSIT FINANCIAL INCLUSION IN NIGERIA

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Abstract

The challenge of achieving deposit financial inclusion for all Nigerians, particularly those in rural communities, remains significant, with millions still lacking access to formal financial services. This study addresses a critical knowledge gap regarding the influence of various financial innovations in Nigeria, such as internet and mobile banking, point of service (POS), and agency banking, on the government's financial inclusion policies. To explore this topic, we conducted an econometric analysis using time series data obtained from the Central Bank of Nigeria (2023 statistical bulletin) and the World Bank (2023 World Development Index report). The Autoregressive Distributed Lag (ARDL) model was utilized for data analysis. The findings of the study reveal that internet and mobile banking has a negative but insignificant effect on deposit financial inclusion in Nigeria, while point of service has an insignificant positive effect on deposit financial inclusion in Nigeria. Similarly, agency banking was found to have an insignificant positive effect on deposit financial inclusion in the country. The study concludes that financial innovations have not made drastic improvement in financial inclusion in Nigeria. The development of technologies that encourage opening of deposit accounts with financial institutions seamlessly without much hassles or needing high level of literacy are recommended by the study. Also, the government and other stakeholders in the Nigerian financial sector are encouraged to equip financially excluded Nigerians with POS machines, mobile smartphones, and trainings in information and communication technology (ICT), especially for the rural populations. Improving network service quality in these areas is also vital for better financial inclusion.

Keywords: Financial innovation, Deposit, Financial inclusion, Nigeria

INTRODUCTION

Innovation, as described by Baregheh, Rowley, and Sambrook (2009), is a multi-stage process through which organizations transform ideas into new or improved products, services, or processes. This enables them to progress, compete, and successfully distinguish themselves within the marketplace. Financial innovation encompasses the introduction of new financial instruments into financial institutions and markets, facilitated by emerging technologies. It is also an ongoing endeavour that involves launching and promoting financial products and services, developing new processes, engaging with customers, and creating new frameworks for financial institutions to adapt to the ever-evolving economic landscape (Jahir, Shah, Arif, Ahmad Aziz & Ullah, 2018; Ozurumba & Onyeiwu, 2019).

By enhancing the efficiency of financial intermediation, financial innovation expands the range of

financial products and services available, leading to better alignment between the needs of individual savers and firms seeking funding for future expansion. This dynamic ultimately promotes economic growth and transforms a country's financial system. In Nigeria, the financial landscape can be broadly categorized into two sub-sectors: the informal and formal sectors. The informal sector lacks a formalized institutional framework and structure of rates, encompassing local money lenders, thrift organizations, loan associations, and microfinance groups. As noted by Olofin and Afandigeh (2008), this sector remains underdeveloped, limited in reach, and disconnected from the formal financial system. Its precise size and economic impact are still unclear and largely speculative. Conversely, the formal sector consists of clearly defined money and capital market institutions.

Globally, the financial services industry has undergone a significant transformation, evolving from traditional transaction methods to modernized systems that incorporate innovative techniques for delivering services more efficiently and reaching a broader customer base. To grasp financial inclusion, one must first understand the concept of financial exclusion, which refers to the barriers preventing individuals from accessing formal financial services. As explained by Ozili, Ademiju, and Rachid (2023), financial inclusion signifies access to and utilization of available formal financial services to enhance the welfare of individuals within a country. This encompasses a process where all economic participants can easily open bank accounts, access credit facilities, and consistently utilize financial products and services (Nwankwo & Ogbodo, 2014).

In recent times, achieving financial inclusion for all members of society, particularly regarding the opening of deposit accounts, has become a key objective for financial sector stakeholders and policymakers around the globe (Nair, 2014). The underlying concern is that those who are financially excluded may struggle to access affordable credit, severely hindering their ability to grow their businesses. True financial inclusion is reached only when every adult can easily access a diverse array of formal financial services that cater to their needs at reasonable costs, particularly when it comes to deposit accounts. The activities of excluded groups can detrimentally affect the effectiveness of monetary policy. Therefore, it is crucial for financial regulators and authorities to develop incentive strategies aimed at promoting the financial inclusion of these disadvantaged individuals and business operators (Ozili, 2023; Umeghalu, Imoagwu, Okafor, & Ezeoke, 2021).

Financial innovation plays a vital role in enhancing the efficiency of the financial system, bringing noticeable economic benefits through ongoing changes. Those involved in creating new financial products must delve into advanced knowledge of optimization and financial modeling techniques that extend beyond basic finance theory. As highlighted by Khraisha and Arthur (2018), financial innovation encompasses the development, promotion, and adoption of new products and services, as well as technological advancements that transform how financial activities are conducted. Such innovations significantly enhance the reach of financial products and services to the financially excluded population. With technology progressing, many individuals who might have otherwise

been left out can now access financial services and products. Recent noteworthy financial innovations within the sector include point of service (POS), internet/mobile banking, agency banking, and automated teller machines (ATM). Many Nigerian banks have embraced these advancements, and today, internet/mobile banking, POS, and ATMs are the predominant forms of e-banking in Nigeria.

In recent years, electronic banking has emerged as a transformative force reshaping the banking industry into a more competitive landscape. As noted by Abanewe, Ogbulu, and Ndugbu (2013), electronic banking refers to conducting banking transactions electronically, leveraging information and communication technology to pursue both immediate and long-term objectives. However, despite the advancements in financial innovations in Nigeria, significant challenges persist that warrant attention.

A primary obstacle is the inadequate infrastructure, especially concerning internet connectivity and electricity. Ozurumba and Onyeiwu (2019) highlight how these substandard infrastructures hinder the effective operation of financial innovations in Nigeria. Achieving comprehensive financial inclusion in Nigeria has proven to be a complex task, exacerbated by various issues, including poor infrastructural facilities, a lack of understanding regarding internet and mobile banking, security concerns, limited knowledge of ICT, challenges with POS machine operations, poverty, and the inability to acquire mobile smartphones, especially among rural populations. Additionally, the prevalence of online fraud and account hacking poses further complications.

Despite the efforts made by banks to implement financial innovations aimed at reaching the millions of financially excluded Nigerians, the outcomes have not been sufficiently impactful, raising questions about the effectiveness and reliability of these innovations. The disparity between financially included and excluded Nigerians remains considerable. It is the attempt to bridge the yawning gap between the financially included and excluded that this study has been embarked upon.

From a broad perspective, this study aims to explore how financial innovations influence deposit financial inclusion in Nigeria. It specifically attempts to evaluate the effects of internet/mobile banking, point of service, and agency banking on deposit financial inclusion in Nigeria. This is done with the intention to determine if financial technological innovations have improved financial inclusion in the country, especially in the long-run. This study covers the period from 2009 to 2022, selected due to the availability of relevant data and the significant emergence of financial innovations during this timeframe.

Conceptual Issues

Financial Innovation

Internet/Mobile Banking: Internet/mobile banking refers to the utilization of mobile devices and the internet to access and deliver financial products and services. In Nigeria, this innovative model serves as an effective means to connect with unbanked individuals; however, challenges remain, particularly regarding internet coverage and the risk of fraud.

Point of Service: Point of service refers to a device that allows bank customers to access a limited range of banking products and services at various service locations. The advent of ICT-enabled financial services has facilitated the extension of banking services to remote and rural areas (Okoye, Nwisienyi & Obi, 2019; Nair, 2014).

Agency Banking: Agency banking involves establishing bank agents in rural areas or villages where traditional banks face logistical and infrastructural challenges. Agency banking may encompass microfinance banks, deposit finance cooperative societies, loan associations, and micro volunteer cooperative associations (Emmanuel, 2020).

Financial Inclusion

Vincent (2024) defines financial inclusion as a process that guarantees universal access, availability, and utilization of the formal financial system for all members of an economy. In line with this, Nair (2014) emphasizes that it aims to provide access to appropriate financial products and services for all societal segments, particularly vulnerable groups such as low-income and weaker populations, at an affordable cost, in a fair and transparent manner, facilitated by regulated mainstream institutional players.

The Effects of Financial Innovations on Financial Inclusion

Research by Ene, Abba, and Fatokun (2019) highlights the significant role that point-of-service devices play in enhancing financial inclusion in Nigeria. Similarly, Andrianaivo and Kpodar (2019) found that while many individuals have a strong inclination to save, the lack of accessible financial services and advanced technological solutions often hinder their efforts. Nwafor (2018) further reported that increased internet penetration positively influences financial inclusion in Nigeria. In Kenya, Monyoncho (2018) indicated that many customers feel accessing formal financial services has become easier due to advancements like ATMs and master cards. A study by Nyimbiri (2021) indicates a strong positive relationship between financial technology and financial inclusion across sub-Saharan Africa. Additionally, the research conducted by the Asian Development Bank (2021) shows that inclusive digital finance could assist Asian banks in reducing operational costs by minimizing paperwork and branch maintenance, ultimately facilitating easier access to funds for customers (Umeghalu, Agupusi, & Uzodigwe, 2019).

REVIEW OF RELATED LITERATURE

Empirical works that border on financial technology and financial inclusion are replete in the literature. Achugamonu, Alexander, Gershon, Ajibola, and Lawrence (2020) conducted a comprehensive study using secondary data from 27 sub-Saharan African countries over the period 2007-2017, to explore the causal relationship between digital finance and financial inclusion. They utilized the Granger error correction model and the general method of moments (GMM) for their analysis. Findings of the study reveal the existence of a long-term positive relationship between the two. This study is relevant to our current research as it focuses on digital finance, which includes mobile banking and POS devices, and carries important policy implications for digital finance.

Usman (2020) assessed the impact of electronic banking on Nigeria's financial inclusion by analyzing the number of ATMs, POS systems, and internet banking activities during the review period. Employing the statistical package for social sciences (SPPS) and a multiple linear regression model for data analysis, the study concluded that POS devices have a significant effect on financial inclusion, contrasting with online banking and ATMs. This work also offers valuable insights for electronic and digital finance policies.

Okoyeuzu, Kalu, and Ukpere (2019) examined the influence of electronic payment channels on financial inclusion in Nigeria using quarterly data from the Central Bank of Nigeria's Statistical Bulletin. Their analysis, conducted via the autoregressive distributed lag (ARDL) model, revealed that digital financial outlets have a positive and significant impact on financial inclusion. This study also has important implications for digital finance policy.

Chinwe, Ebere, and Wilfred (2019) conducted a study to evaluate the effect of electronic payment methods on financial inclusion in Nigeria, utilizing quarterly data from the Central Bank of Nigeria's statistical bulletin. They employed an autoregressive distributed lag model for their analysis, which revealed that characteristics linked to financial inclusion were positively and significantly influenced by digital financing channels. This research also offers valuable insights for digital finance policy.

Emmanuel (2020) explored the relationship between financial innovation and financial inclusion within Cameroon's financial sector. His study analyzed a time series dataset from 2010 to 2019, sourced from the Banque Internationale du Cameroon Pour L'Epargne et le Credit (BICEC). The methods used for analysis included descriptive statistics, Pearson correlation, and Ordinary Least Squares (OLS) technique. Findings of the study reveal that mobile money transactions positively impacted financial inclusion, specifically regarding deposit accounts, while agency banking had a negative effect on the same parameter. The study highlights important policy implications for mobile money transactions.

Lastly, Ashiru, Balogun, and Paseda (2023) investigated the effects of financial innovation on the performance of deposit money banks in Nigeria. Their research encompassed various financial innovations, including mobile and internet banking, automated teller machines (ATMs), point of service (POS), mobile money payments (MMP), national electronic fund transfers, and credit and debit card systems, measuring financial performance through return on equity. This econometric study analyzed a time series dataset from 2001 to 2021, using autoregressive distributed lag (ARDL) model and Granger causality tests. The findings of the study indicate that the POS system has the most significant positive impact on deposit money bank performance, driven by high transaction volumes and values within the sector. Additionally, various innovations, including ATMs, mobile banking, credit and debit cards, online banking, and agency banking, were found to have long term positive effects on bank performance in Nigeria, though the national electronic fund transfer and NIBSS exhibited different results. The findings underscore the policy implications for the POS system, ATMs, mobile banking, credit and debit card systems, online banking, and agency banking.

RESEARCH METHOD

Theoretical Framework

This study is grounded in the theory of task-technology fit (TTF), which was introduced by Goodhue and Thomson in 1995. The TTF posits that the positive impact of information technology on individual performance hinges on the alignment between the capabilities of information and communication technology (ICT), and the tasks that users are required to perform. The authors identified several factors that can be utilized to evaluate task-technology fit, including quality, accessibility, authorization, complexity, ease of use, training requirements, production timelines, system reliability, and the relationship with users. A key strength of this theory is its assertion that technological advancements can enhance financial inclusion through innovative solutions such as internet and mobile banking, as well as point-of-service systems. These innovations, enabled by technology, effectively meet the demands of financial services, highlighting the relevance of this theoretical framework to the current study. However, it is important to note a significant drawback: many potential users of these financial technologies may lack ICT literacy, which can result in their continued exclusion from formal financial systems.

Model Specification

The study adopted autoregressive distributed lag model which is explicitly expressed as follows:

$$\Delta \ln F1_t = \alpha_1 + \beta_1 \Delta \ln F1_{t-1} + \beta_2 \Delta \ln AB_{t-1} + \beta_3 \Delta \ln IMB_{t-1} + \beta_4 \Delta \ln POS_{t-1} + \varepsilon_t \quad (1)$$

Where: F1= Financial inclusion, AB = Agency Banking, IMB=internet/mobile, POS= point of service, α0= Function of the internet, Δ = First differences, Σ= summation, ln = Logarithm, t_{-1} = Lag (time lag), β_1-β_4 = Coefficients of the explanatory variables and ε_t = Error term.

A change in the dependent variable (F1) can be expressed as a function of the intercept (α0), along with explanatory variables from the previous time period ($_{t-1}$) up to a maximum of p levels and incorporating lagged values (Q_k) in first difference (Δ), plus the error term (ε_t) at time $_t$.

The null hypothesis of no co-integration [H0:00+01+---+0k≠0] is evaluated based on derived statistics that reference the critical values and approximate probability values, as outlined by Kripfganz and Schneider (2019). To successfully reject the null hypothesis, it is necessary for the estimated F-statistic and t-statistic to be more extreme than the upper critical values, with corresponding approximate probability values falling below 0.05.

Granger Causality Model Specification

In Granger causality test, causality is exposed in pairs of regression equations by simply swapping the independent and dependent variables

For agency banking and financial inclusion, the equation is rewritten thus:

$$AB_t = \phi_1 + \boldsymbol{\Sigma}\phi_{1t}\, AB_{t-1} + \boldsymbol{\Sigma}\phi 2iF1_{t-1} + e_{it} \quad (2)$$

$$F1_t = B_2 + \boldsymbol{\Sigma}B_{1t}\, F1_{t-1} + \boldsymbol{\Sigma}B_{2t} + AB_{t-1} + e\, e_{2t} \quad (3)$$

For point of service and financial inclusion, the equation is rewritten thus:

$$POS_t = \phi_1 + POS_{t-1} + \boldsymbol{\Sigma}\phi 2iF1_{t-1} + e_{it} \quad (4)$$

$$F1_t = B_2 + \boldsymbol{\Sigma}B_{1t}\, F1_{t-1} + \boldsymbol{\Sigma}B_{2t} + AB_{t-1} + e_{2t} \quad (5)$$

For internet/ mobile banking and financial inclusion, the equation is rewritten thus:

$$IMB_t = \phi_1 + \boldsymbol{\Sigma}\phi_{1t}\, IMB_{t-1} + \boldsymbol{\Sigma}\phi 2iF1_{t-y} + E_{1t} \quad (6)$$

$$F1_t = B_2 + \boldsymbol{\Sigma}B_{1t}F1_{t-1} + \boldsymbol{\Sigma}B1i\, IMB_{t-1} + e_{2t} \quad (7)$$

Where ϕ= the coefficient to be determined, B= the intercept of the relationship in the models, and $\boldsymbol{\Sigma}$= summation.

Data and Data Sources

The secondary data used for the study were sourced from the central bank of Nigeria (2023) statistical bulletin and World Bank World Development Index. Financial inclusion was measured as the percentage (%) of deposit accounts in the years 2009-2022. Agency banking was measured using the number of registered bank agents in the country from 2009-2022. Point of service was measured using the number of POS transactions from 2009-2022. And finally, internet/ mobile banking was measured using the number of IMB transactions from 2009-2022.

Estimation Techniques and Procedures

The use of ARDL as an estimation technique in a study is usually of the essence when the data of the study have a mix of stationary levels, that is, when the data of some of the variable of the study are stationary at level while the others are stationary at first difference. However, it is also important to note that ARDL can also be used when the data of all the variables of the study are stationary at level or are all stationary at fist difference. Unit root tests were performed to determine the stationarity of the data used in the study. While ARDL was used to determine the existence of long run relationship among the variables of the study, error correction model (ECM) was used to determine the existence of short run relationship among the variables, and the mechanism which helps maintain long run equilibrium, if actually a long run relationship exist.

The ARDL model is justified on the grounds that it contains lagged values of the dependent variable, and the current and lagged values of the explanatory variables. It is also suitable for variables stationary at level and first difference. Applying the ARDL model gives unbiased long-run estimates, and it is also more efficient in the case of small and finite sample sizes.

DATA ANALYSES, PRESENTATION AND DISCUSSION OF RESULTS

The result of the ARDL model analysis is as presented in table 1.

Table 1: ARDL Model Analysis Result

Dependent variable: F1
Method: ARDL
Date: 08/22/24. Time :07:06
Sample (adjusted): 2 14
Included observations: 13 after adjustment
Maximum dependent lags: 1 (automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic repressors (1lag, automatic): LNAB LNIMB LNPOS
Fixed repressor: C
Number of models evaluated: 8
Selected model: ARDL (1,1,1,1)

Variable	Coefficient	Std. Error	t-statistic	Prob*
F1(-1)	0.473067	0.374415	1.263483	0.2621
LNAB	-0.616898	2.240989	-0.275279	0.7941
LNAB(-1)	2.812151	2.394144	1.174595	0.2930
LNIMB	-1.104216	4.544880	-0.242958	0.8177
LNIMB(-1)	-4.604279	2.015993	-2.283877	0.0412
LNPOS	0.177929	3.593190	0.049518	0.9624
LNPOS(-1)	5.046840	2.910281	1.734142	0.1434
C	-2.505659	7.394800	-0.338841	0.7485
R-squared	0.958657	Mean dependent var.		25.79538
Adjusted R-squared	0.900777	S.D. dependent var		7.469118
S.E of regression	2.352743	Akaike info criterion		4.824299
Sum. Squared	27.67700	Schwarz criterion		5.171960
Log likelihood	-23.35794	Hunnan- Quinn critter.		4.752839
f-statistic	16.56290	Durbin Watson stat		2.569754
Prob(F-statistic)	0.003504			

Source: Researchers' Computation using E-view 9 (2025)

In Table 1, internet and mobile banking has a t-statistic of -0.242958, which exceeds the critical value of -1.96. Consequently, we accept the null hypothesis (H_0) and infer that internet/mobile banking has no significant effect on deposit financial inclusion in Nigeria. The corresponding probability value of 0.8177, which is greater than 0.05 at the 5% significance level confirms that the estimated relationship between internet and mobile banking and deposit financial inclusion is not significant. Furthermore, point of service has a t-statistic of 0.049518, which is less than the critical value of 1.96. Consequently, we also accept the null hypothesis (H_0) here, concluding that point of service does not have a significant effect on deposit financial inclusion in Nigeria.

The probability value of 0.9624 which is greater than 0.05 at the 5% significance level confirms that the estimated relationship between point of service and deposit financial inclusion is not significant. Lastly, agency banking has a t-statistic of -0.275279, which again exceeds the critical value of -1.96. Therefore, we accept the null hypothesis (H_0) and conclude that agency banking does not significantly affect deposit financial inclusion in Nigeria. The probability value of 0.7941 which is above the 0.05 threshold at the 5% significance level, confirms that the estimated relationship between point of service and deposit financial inclusion is not significant.

The ADRL-bound test of Cointegration result is as summarized in Table 2.

Table 2: ADRL-bound Test for Cointegration

ARDL. Bounds Test
Data: 08/22/24. Time 07:09.
Sample 214
Included observations: 13
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-Statistic	3.412611	3
Critical Value Bounds		
Significance	10 Bound	11 Bound
10%	2.72	3.77
5%	3.23	3.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Researchers' Computation using E-view 9 (2025)

The cointegration test result presented in Table 2 shows that the F-statistic of 3.412611 is greater than the critical upper bound 1 (1) at 5% significance level. This indicates that there is cointegration in the model (existence of long-run relationship.

The lag structure is presented in Table 3. The lag length of two years was used in the study, employing the Akaike information criterion.

Table 3: VAR Lag Order Selection Criteria

Endogenous variables: FILNAB LNIMB LNPOS
Exogenous variables: C
Data: 08/22/24. Time: 07:03
Sample: 1 14
Include Observations: 13

Lag	LogL	LR	FPE	AIC	SC
0	-77.28709	NA	3.175346	12.50571	12.67954
1	-28.63322	59.88170*	0.024657*	7.482033*	8.351186*

Source: Researchers' Computation using E-view 9 (2025)

The auto-correlation test result is as shown in Table 4.

Table 4: Autocorrelation Test

Breusch-Godfrey	Serial	Correlation	LM Test
F-statistic	1.349872	Prob. F(1,4)	0.3099
Obs* R-squared	3.280142	Prob. Chi-sq (1)	0.0701

Source: Researchers' Computation using E-view 9 (2025)

Since the probability value of 0.070 is greater than 0.05, we conclude that there is no autocorrelation in the model.

The heteroscedasticity test result is as shown in Table 5.

Table 5: Breusch-Pagan-Godfrey Heteroscedasticity Test

F-Statistic	0.598859	Prob. F (7, 5)	0.7408
Obs * R-squared	5.928642	Prob. Chi-Sq (7)	0.5481
Scaled explained SS	1.239515	Prob. Chi-Sq (7)	0.9900
Heteroscedasticity Test: ARCH			
F-Statistic	0.158775	Prob. F (1, 10)	0.6987
Obs * R-Squared	0.187552	Prob. Chi-Sq (1)	0.6650

Source: Researchers' Computation using E-view 9 (2025)

From the heteroscedasticity test result in Table 5, the F-statistic probability values for Breusch – Pagan-Godfrey test and ARCH test of 0.7408 and 0.6987 respectively are both greater than 0.05 at 5 percent level of significance. We conclude that there is no heteroscedasticity in the models.

Discussion of Findings

The results of the study reveal that internet/mobile banking (IMB), point of service (POS), and agency banking (AB) do not have significant effects on deposit financial inclusion in Nigeria. This differs from previous studies that were examined, which showed a substantial positive influence of these financial innovations on inclusion. The findings from our research clearly suggest that both internet/mobile banking and agency banking lack significant effects on deposit financial inclusion. Point of service also shows no significant effect, even though it has a positive influence. Overall, these results indicate that the three financial innovations—internet/mobile banking, point of service, and agency banking—have not effectively enhanced the deposit financial inclusion among financially excluded individuals in Nigeria.

CONCLUSION

In conclusion, the insignificant influence of internet/mobile banking, point of service, and agency banking on deposit financial inclusion in Nigeria may be attributed to several interconnected factors. They include a limited number of POS, IMB, and AB transactions, especially in the rural areas, the inefficient services provided by the internet and network services providers, particularly in rural area, challenges with electricity and power supply, financial constraints preventing access to POS machines, mobile smartphones and data services, low levels of ICT literacy, concerns about online banking fraud related to POS, and a scarcity of electronic devices and agency banking options in rural communities.

Based on these findings, the researchers recommend the following:

To enhance the reach of agency banking in our country, especially in rural regions. Commercial banks and the government should collaborate with the Central Bank by forming partnerships with non-governmental organizations in the financial sector. This strategic alliance can significantly increase the number of bank agents available.

Moreover, the government should work alongside philanthropic foundations to uplift financially excluded Nigerians affected by poverty, particularly in rural areas. This can be achieved by providing them with POS machines, mobile smartphones, and essential training in information and communication technology (ICT).

Network providers in the country should focus on improving the quality of their services and the expansion of coverage, particularly in disadvantaged rural areas. Similarly, electricity and power distribution companies should ensure that power supply is reliable and efficient, particularly in these regions.

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