

Digital Financial Services and Economic Growth in Nigeria

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Abstract

This study examines the effect of digital financial services on economic growth in Nigeria, measured by real GDP per capita growth. Specifically, it investigates the effects of ATM transactions, POS transactions, mobile payment transactions, and internet penetration using the Autoregressive Distributed Lag (ARDL) approach. Quarterly data were sourced from the Central Bank of Nigeria, World Bank, United Nations Development Programme, and National Bureau of Statistics. The study employed descriptive statistics, KPSS unit root tests, ARDL bounds cointegration tests, ARDL estimation, Granger causality tests, and diagnostic tests. The results revealed mixed orders of integration and confirmed the existence of long-run relationships between digital financial services and economic growth indicator. The findings reveal mixed short-run effects: internet penetration and POS transactions have significant positive effects on real GDP per capita growth, while ATM and mobile payment transactions exert significant negative effects. In the long run, the effects of all four digital financial service indicators are statistically insignificant. The significant error-correction term indicates that approximately 72% of short-run deviations from long-run equilibrium are corrected annually. The study concludes that digital financial services contribute more strongly to short-run than long-run economic growth in Nigeria and recommends among others that the government should invest in reliable and affordable internet infrastructure, particularly in underserved communities.

Keywords: Digital Financial Services, Economic Growth, Automated Teller Machine, Point-of-Sale, Mobile payments, Internet Penetration.

1. Introduction

Digital financial services (DFS) have become an important component of financial-sector development, particularly in developing economies where digital technologies can reduce transaction costs, expand access to financial services, and improve the efficiency of economic exchanges. DFS encompass a range of technology-enabled financial services, including Automated Teller Machines (ATMs), Point-of-Sale (POS) terminals, mobile payments, and internet-based financial services. Through these channels, digitalization can strengthen financial intermediation, facilitate savings and payments, improve resource allocation, and potentially enhance economic productivity and growth (Demirgüç-Kunt et al., 2022; Ozili, 2018). Nigeria provides an important setting for examining this relationship because of the rapid expansion of its digital-payment ecosystem. According to the Central Bank of Nigeria (CBN, 2024), the value of POS transactions increased from approximately ₦3.2 trillion in 2019

to ₦110.4 trillion in 2023, while mobile-money transactions rose from about ₦5.1 trillion to ₦97.2 trillion over the same period. ATM transaction value also increased from approximately ₦6.5 trillion to ₦28.2 trillion. At the same time, internet penetration reached about 41% of the Nigerian population in 2024, up from 39% in 2023 (World Bank, 2024).

The growing use of digital financial services has generated increasing scholarly interest in their potential contribution to economic growth. Theoretically, digital payments can stimulate economic activity by lowering transaction costs, facilitating formal financial participation, and improving the speed and security of payments. Empirically, however, the evidence is not conclusive. Appah et al. (2023), using Nigerian data for 2006–2021, found that POS and web-banking services had significant positive effects on economic growth, while ATM and mobile-banking services were statistically insignificant. Similarly, Igoni et al. (2020) identified digital financial services as an increasingly important component of Nigeria's financial environment, while Birigozzi et al. (2025) reported a positive relationship between digital-payment adoption and GDP growth using international evidence. These findings suggest that the growth effects of digital finance may differ according to the specific digital-financial channel examined.

Despite the substantial expansion of DFS in Nigeria, concerns remain about whether this digital transformation has translated into stronger economic performance per person. Nigeria recorded real GDP growth of approximately 3.3% in 2023 and 4.1% in 2024, but real GDP per capita growth was only about 1.2% and 1.9%, respectively (World Bank, 2026). This divergence raises an important empirical question because an increase in aggregate output does not necessarily imply a comparable improvement in output per person. Moreover, existing Nigerian studies have largely focused on aggregate GDP and have not consistently examined ATM transactions, POS transactions, mobile payments, and internet access jointly in explaining real GDP per capita growth. Consequently, there remains limited evidence on whether, and through which channels, the expansion of digital financial services contributes to economic growth on a per-capita basis in Nigeria. This study addresses this gap by empirically examining the effects of ATM transaction value, POS transaction value, mobile payment transaction value, and internet access on real GDP per capita growth in Nigeria.

2. Literature Review

Theoretical Review

Financial Development Theory

Financial Development Theory is rooted in the work of Joseph Schumpeter (1911) and was subsequently developed by Ronald McKinnon (1973) and Edward Shaw (1973). Schumpeter argued that financial institutions contribute to economic development by mobilizing resources, facilitating investment, and directing finance toward innovative and productive activities. McKinnon (1973) and Shaw (1973) subsequently emphasized financial deepening, arguing that an efficient and less-repressed financial system promotes saving and investment and, consequently, economic growth. Later contributions, particularly Levine (2005), identified financial functions such as mobilizing savings, allocating capital, facilitating trade, managing risk, and monitoring investments as important mechanisms linking finance to growth.

The theory assumes that financial markets and intermediaries perform their functions efficiently, that financial resources can be mobilized and allocated toward productive activities, and that improvements in financial access and efficiency can enhance investment and productivity. Applied to the present study, digital financial services can be regarded as an extension of financial intermediation. ATM, POS, and mobile-payment transactions can improve the efficiency and accessibility of financial transactions, while internet access provides an important infrastructure for accessing digitally delivered financial services. Thus, greater development and use of DFS are expected to improve financial efficiency and

potentially contribute to higher real GDP per capita growth. This theory therefore provides the principal theoretical foundation for the study.

Endogenous Growth Theory

Endogenous Growth Theory was developed principally by Paul Romer (1986, 1990) and Robert Lucas (1988). Unlike the traditional neoclassical growth model, endogenous growth theory argues that long-run economic growth can arise from factors generated within the economic system, particularly technological change, knowledge accumulation, human capital, innovation, and learning. Romer's (1986) model emphasizes knowledge as an input capable of generating increasing returns, while Romer (1990) explicitly models technological change as resulting from intentional investment decisions. Lucas (1988), meanwhile, emphasizes human-capital accumulation and learning as sources of sustained growth.

The theory assumes that technological knowledge and human capital can generate productivity improvements, that investment in knowledge and technology can produce spillover effects, and that technological progress need not be treated as an external factor. These assumptions are relevant to Nigeria's digital transformation because internet access facilitates the diffusion of information and technology, while digital financial platforms enable households and firms to conduct economic activities more efficiently. Increased digital connectivity may therefore enhance productivity, innovation, market participation, and financial inclusion, creating a pathway from digitalization to economic growth. The theory consequently provides a strong explanation for including internet penetration alongside transaction-based DFS indicators in the growth model.

Transaction Cost Economics

Transaction Cost Economics (TCE) originated from Ronald Coase (1937) and was subsequently developed into a broader analytical framework by Oliver Williamson, particularly during the 1970s and 1980s. Coase (1937) argued that economic exchange is not costless: searching for information, negotiating agreements, and completing transactions involve costs. Firms and alternative institutional arrangements emerge partly because they can reduce the costs associated with using markets. Williamson subsequently developed TCE into a framework for explaining how alternative governance arrangements can minimize transaction and contracting costs, emphasizing behavioural assumptions such as bounded rationality and opportunism, as well as factors such as uncertainty and asset specificity.

The central assumption of TCE is that economic agents operate in an environment where information, contracting, monitoring, and exchange are costly. Institutions and technologies that reduce these costs can therefore improve economic efficiency. This provides a direct theoretical explanation for the potential growth effects of digital financial services. POS and mobile payments, for example, can reduce the time and inconvenience associated with conventional payment methods; ATMs can reduce the cost of accessing financial services; and internet connectivity can lower information and communication costs. By reducing the frictions associated with financial and commercial transactions, digital technologies can facilitate greater economic exchange and improve resource allocation, potentially contributing to higher real GDP per capita growth.

Empirical Review

Ogunseni et al. (2026) investigated the influence of digital financial services (DFS) on economic expansion, assessed via GDP per capita, and analysed the role of digital financial metrics in both short- and long-term growth patterns. Rooted in Human Development Theory and the Unified Theory of Acceptance and Use of Technology (UTAUT), the research utilised

an ex post facto methodology, leveraging secondary data from 2010 to 2024, obtained from the World Development Indicators and associated databases. Analytical techniques encompassed descriptive statistics, Autoregressive Distributed Lag (ARDL) bounds testing, and Error Correction Models (ECM) to assess the impact of DFS on GDP per capita. Resilience was guarantyd by preliminary assessments and subsequent diagnostic evaluations. The results indicated that DFS had a substantial impact on GDP per capita ($\text{Adj. } R^2 = 0.824$, $F(5,9) = 12.299$, $p < 0.05$), with account ownership and internet penetration identified as key factors. Both metrics demonstrated beneficial short-term effects and enduring long-term influences, highlighting the pivotal role of digital connectivity and financial accessibility in Nigeria.

Aninwagu et al. (2026) applied the ARDL bounds testing approach of Pesaran, Shin, and Smith (2001) to analyse the determinants of Nigeria's economic growth from 1990 to 2023. Using real GDP *per capita* as the dependent variable, the model incorporates total trade, foreign direct investment (net inflows), gross fixed capital formation, and government recurrent spending on education. Results showed that trade and education spending exert negative short-run effects, while FDI has a negative short-run but significant positive long-run impact. Gross fixed capital formation has a positive and significant effect on growth in the short run, but not in the long run. The error correction term confirmed a stable long-run equilibrium, with 62% adjustment annually. The model explains 91.5% of growth variations, indicating strong explanatory power.

Ozili et al. (2023) examined the impact of financial inclusion on economic development in both religious and secular nations. The metrics of financial inclusion encompassed the quantity of automated teller machines (ATMs) per 100,000 adults and the count of bank branches per 100,000 adults, both illustrating the accessibility aspect of financial inclusion via physical service locations. The two-stage least squares (2SLS) regression technique was utilised to examine the impact of financial inclusion on real GDP per capita growth and total real GDP growth in both religious and secular nations. The results indicated that the reduction of bank branches markedly enhanced economic growth in secular nations. The proliferation of bank branches alongside increased internet utilisation markedly boosted economic growth in secular nations, but an abundance of ATMs together with heightened internet usage hindered economic expansion. Moreover, the research indicated that the proliferation of bank branches in the context of an expanding poverty divide markedly enhanced economic growth in religious nations, suggesting that financial inclusion via bank branch proliferation substantially fostered economic advancement in economically disadvantaged religious countries. The utilisation of the internet was recognised as a significant factor influencing economic growth in secular nations.

Mashrur (2024) investigated the impact of digital financial inclusion (DFI) on economic development in three South Asian nations: Bangladesh, Pakistan, and Nepal. Employing data from the World Bank and the IMF, the Generalised Method of Moments (GMM) was utilised to examine the effect of DFI on GDP growth. The results indicated that a single-unit rise in the Digital Financial Inclusion Index resulted in a 48.32-unit gain in GDP per capita, highlighting the essential function of digital financial services in boosting economic output. The research also examined the impact of several economic factors, such as foreign direct investment, trade, inflation, and government spending, to offer a thorough perspective on the elements driving economic growth. The findings underscored the revolutionary capacity of digital financial services to enhance economic engagement and indicated that deliberate investments in digital infrastructure and conducive regulatory environments were essential for optimising these advantages.

Boranbayeva et al. (2025) sought to ascertain causal connections between infrastructural development and significant macroeconomic metrics. A blend of quantitative, correlation, and regression analysis was utilised to evaluate the relationship between infrastructure factors, such as the quantity of bank cards, POS terminals, and ATMs, and macroeconomic metrics including GDP, GDP per capita, and population size. The

examination disclosed a consistent affirmative correlation between the growth of banking infrastructure and the primary metrics of economic development. The findings indicated that the advancement of financial infrastructure improved the availability of digital financial services and facilitated the shift toward a more inclusive and efficient financial system. The research determined that banking infrastructure acted as a crucial catalyst for digital change inside the national economy.

Aninwagu and Onyema (2025) examined the relationship between financial inclusion and economic resilience in Nigeria from 1990 to 2023, The OLS analysis indicated a negative and statistically significant relationship between the inflation rate and GDP growth, with a coefficient of -0.119173. This suggests that a one unit increase in the inflation rate leads to a decrease in GDP growth by approximately 0.119173 units in the long run. Furthermore, the results showed a negative and statistically significant impact of internet usage on GDP growth, with a coefficient of -0.098994, indicating that increased internet penetration is associated with a reduction in GDP growth in Nigeria. Additionally, the analysis showed that the SME financing has a positive but not statistically significant impact on GDP growth, with a unit increase in SME financing leading to an increase in GDP growth by 0.904737 units.

Employing a cross-sectional instrumental variable methodology for novel measures of financial inclusion, Khera et al. (2021) examined these enquiries across 52 developing nations. Utilising a cross-sectional instrumental variable methodology, the research determined that the exogenous aspect of digital financial inclusion correlated positively with GDP per capita growth from 2011 to 2018, indicating that digital financial inclusion fostered economic advancement. Fractional logit and random effects empirical analysis revealed that access to infrastructure, financial and digital literacy, and institutional quality are crucial factors influencing digital financial inclusion. These results were later utilised to guide policy suggestions concerning the digitalisation of financial services aimed at enhancing financial inclusion.

3. Methodology

This study adopts an ex-post facto research design. The data for this study was sourced from the World Bank's World Development Indicators (WDI) and the Central Bank of Nigeria Statistical Bulletin from the first quarter of 2009 to the fourth quarter of 2024. The modelling of this study was theoretically anchored on financial development theory.

The study specifies the following model:

$$GDPPC = f(\ln ATMV, \ln POSV, \ln MOBV, \ln INTP) \quad 3.1$$

$$GDPPC_t = \beta_0 + \beta_1 \ln ATMV_t + \beta_2 \ln POSV_t + \beta_3 \ln MOBV_t + \beta_4 \ln INTP_t + \varepsilon_t \quad 3.2$$

$$\begin{aligned} \Delta GDPPC_t = \alpha_0 &+ \sum_{i=1}^p \alpha_1 \Delta GDPPC_{t-1} + \sum_{i=1}^q \alpha_2 \Delta \ln ATMV_{t-1} + \sum_{i=1}^q \alpha_3 \Delta \ln POSV_{t-1} \\ &+ \sum_{i=1}^q \alpha_4 \Delta \ln MOBV_{t-1} + \sum_{i=1}^q \alpha_5 \Delta \ln INTP_{t-1} + \lambda_1 GDPPC_{t-1} + \lambda_2 \ln ATMV_{t-1} \\ &+ \lambda_3 \ln POSV_{t-1} + \lambda_4 \ln MOBV_{t-1} + \lambda_5 \ln INTP_{t-1} + \varepsilon_{1t} \end{aligned}$$

Where:

$GDPPG_t$ = GDP per Capita Growth

$\ln ATMV_t$ = Logarithm value of ATM transactions

$\ln POSV_t$ = Logarithm value of POS terminal transactions

$\ln MOBV_t$ = Logarithm value of mobile payment transactions

$INTP_t$ = Internet penetration rate

β_0 = Constant term; $\beta_1 - \beta_4$ = Parameters to be estimated; ε_t = Stochastic error terms; and t = Time period; α_0 = constant parameter to be estimated; $\alpha_1 - \alpha_5$ = short run parameters; $\lambda_1 - \lambda_5$ = long-run multipliers; p = optimal lag for each of the dependent variables; q = optimal lag of the independent variables; Δ = first difference operator; ε_{1t} = error terms.

NOTE: The logarithmic transformation of selected explanatory variables is intended to normalize the data, reduce heteroskedasticity, and interpret coefficients in elasticity terms.

A priori Expectation

$RGDP_{PCt} = \beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0$.

4. Data Analysis

Table 4.1: Summary of descriptive statistics for the variables

	GDPPG	INTP	LNATM	LNMOBV	LNPOSV
Mean	0.698750	25.53937	8.576571	7.030039	7.001731
Median	1.280000	25.01000	8.642363	6.817057	6.941606
Maximum	5.070000	41.21000	10.39354	12.88083	12.31615
Minimum	-8.340000	9.300000	5.990739	0.239017	2.400619
Std. Dev.	3.353703	9.968066	1.320651	3.702217	3.044097
Skewness	-1.076699	0.055795	-0.331027	-0.066666	0.132146
Kurtosis	4.130370	1.884671	2.283361	2.040476	1.981482
Jarque-Bera	15.77295	3.350432	2.538363	2.502570	2.952610
Probability	0.000376	0.187268	0.281062	0.286137	0.228480
Sum	44.72000	1634.520	548.9005	449.9225	448.1108
Sum Sq.					
Dev.	708.5815	6259.828	109.8794	863.5039	583.7911
Observations	64	64	64	64	64

Source: Researcher's computations using Eviews 12, (2026)

The summary statistics presented in Table 4.1 reveal that the mean value for real GDP per capita growth (GDPPG) was 0.69% over the research period. GDPPG fluctuated between a low of -8.34% and a high of 5.07%. The internet penetration rate (INTP) and the logarithm of the value of ATM transactions (LNATM) had average values of 25.53% and 8.57, respectively. INTP recorded minimum and maximum values of 9.30% and 41.21%, while LNATM varied from 5.99 to 10.39. Additionally, the logarithm of the value of mobile payment transactions (LNMOBV) and the logarithm of the value of POS terminal transactions (LNPOSV) exhibited mean values of 7.03 and 7.00, respectively. LNMOBV ranged from 0.23 to 12.88, whereas LNPOSV fluctuated between 2.40 and 12.31. The standard deviations suggest that the data for all variables cluster around their respective means, except for real GDP per capita growth, which has a standard deviation that exceeds its mean. The results of the Jarque-Bera test indicate that all variables, except for real GDP per capita growth (GDPPG), follow a normal distribution, as evidenced by JB and p-values greater than 0.05.

Table 4.2 KPSS Unit Root Test

Variables	KPSS Level	at Critical value 5%	KPSS at 1 st Diff.	Critical value 5%	Order of Integration
GDPPG	0.424748	0.463000	NA	NA	1(0)
LNATM	0.967625	0.463000	0.099434	0.463000	1(1)
LNMOBV	1.010639	0.463000	0.164124	0.463000	1(1)
LNPOSV	1.005903	0.463000	0.174748	0.463000	1(1)
INTP	0.105325	0.146000	NA	NA	1(0)

Source: Researcher's computation using Eviews 12 (2026).

The KPSS unit root test findings shown in Table 4.2 indicate that solely the logarithmic figures of ATM transactions, mobile payment transactions, and POS terminal transactions exhibit non-stationarity, particularly a unit root. The KPSS values of 0.967625, 1.010639, and 1.005903 surpass the crucial threshold of 0.463000 at a 5% significance level.

Nevertheless, an analysis of the initial difference forms of these variables confirms their stationarity, given that their KPSS values of 0.099434, 0.164124, and 0.174748 are below the 5% significance level. This result signifies that, after differentiation, these variables achieve stationarity.

Furthermore, the supplementary variables analyzed were shown to display stationarity in their original form. As a result, the series utilized in the research consists of a mix of I(1) (integrated of order 1) and I(0) (integrated of order 0) variables, as demonstrated in the above table.

4.2.3 Cointegration Test Results

Table 4.3: Bounds cointegration test results for the models

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	8.253170	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Researcher's computation using Eviews 12, (2026).

Note: K denotes the number of independent variables.

The results presented in Table 4.3 demonstrate that the F-statistics for these models, 8.253170, exceed the critical values at both the lower and upper bounds at a 5% significance level. This indicates a strong relationship between the dependent variable and the independent variables.

Model Result and Discussion

Table 4.4: ARDL short and long-run results for real GDP per capita growth

Dependent Variable:

Short-run results				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPPG(-1))	-0.404596	0.091032	-4.444564	0.0001
D(GDPPG(-2))	-0.404596	0.091032	-4.444564	0.0001
D(GDPPG(-3))	-0.404596	0.091032	-4.444564	0.0001

D(INTP)	2.381746	0.397854	5.986486	0.0000
D(INTP(-1))	2.401051	0.342615	7.008017	0.0000
D(INTP(-2))	2.401051	0.342615	7.008017	0.0000
D(INTP(-3))	2.401051	0.342615	7.008017	0.0000
D(LNATM)	-4.600978	0.641889	-7.167868	0.0000
D(LNMOBV)	-4.038460	0.745983	-5.413605	0.0000
D(LNPOSV)	7.258837	0.913622	7.945124	0.0000
CointEq(-1)*	-0.072086	0.009707	-7.426047	0.0000

Long run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTP	-7.883135	7.810180	-1.009341	0.3183
LNATM	-22.77107	18.70917	-1.217107	0.2301
LNMOBV	-33.83684	33.24908	-1.017678	0.3144
LNPOSV	75.83145	68.23257	1.111367	0.2724
C	34.81172	52.88433	0.658262	0.5138

R-squared 0.742643; Adjusted R-squared 0.690121

Source: Researcher's computation using Eviews 12 (2026).

Table 4.4 offers a comprehensive examination of the relationship between real GDP per capita growth and digital financial services, highlighting the immediate and prolonged effects on real GDP per capita growth in Nigeria. In the immediate term, the coefficient for the internet penetration rate for the present year and lags of 1, 2, and 3 periods exhibited a statistically significant positive effect on Nigeria's real GDP per capita growth, indicating that a unit rise in the internet penetration rate enhances Nigeria's real GDP by 2.38, 2.40, 2.40, and 2.40 units, respectively. The findings align with the study's initial hypotheses and the financial intermediation theory proposed by Gurley and Shaw in 1960, subsequently expanded by McKinnon (1973) and Shaw (1973), which asserts that increased financial intermediation via internet access stimulates economic activities and enhances macroeconomic indicators, such as real GDP per capita. Conversely, the long-term results indicated that the internet penetration rate coefficient demonstrates a negative correlation with no statistically significant impact on the growth of real GDP per capita, implying that a one-unit increase leads to a reduction of 7.88 units in real GDP per capita growth in Nigeria over the long term. This result opposes the study's initial hypothesis but is consistent with the empirical results of Mostefaoui et al. (2026), which suggest that internet penetration negatively impacts real GDP per capita.

Furthermore, the preliminary results indicated that the logarithmic coefficient of ATM transactions from the previous year has a statistically significant adverse effect on Nigeria's real GDP per capita. However, the long-term results revealed that the logarithmic coefficient of ATM transactions has a detrimental impact with no statistically significant correlation to real GDP per capita, suggesting that a 1% rise in the logarithmic value of ATM transactions leads to a decline of 22.77 units in Nigeria's real GDP. The outcomes diverge from the study's initial hypotheses yet validate an empirical observation by Afaha (2019), which suggested that ATM transactions negatively influence real GDP per capita.

The ARDL findings indicate that the logarithmic coefficient of mobile payment transactions for the current year has a statistically significant inverse relationship with real GDP per capita growth in Nigeria. The long-term outcomes coefficient exhibited a detrimental impact with no statistically significant effect on the growth of real GDP per capita, indicating that a 1% change in the logarithmic value of mobile payment transactions leads to a 33.83-unit reduction in real

GDP growth in Nigeria. The outcomes oppose the study's preliminary anticipations and the empirical results of Musa et al. (2023) and Ahassan et al. (2021), which indicated that mobile payment transactions have a beneficial effect on real GDP per capita.

The ARDL findings for both short and long durations reveal that the coefficient of the logarithmic value of POS terminal transactions in the short term significantly and positively influences Nigeria's real GDP per capita, suggesting that a 1% variation leads to an increase of 7.25 units in Nigeria's real GDP in the short run. The enduring coefficient findings reveal a favourable association, but do not achieve statistical significance concerning real GDP per capita growth, implying that a single unit rise in the logarithmic measure of POS terminal transactions adds roughly 75.83 units to Nigeria's real GDP per capita growth. These results align with the endogenous growth theory, originally proposed by Paul Romer in 1986 and later enhanced by Robert Lucas in 1988, in addition to the study's initial hypothesis and the empirical data provided by Grzelczak and Soliwoda (2023), which revealed a substantial positive effect of real GDP per capita.

The error correction term $CointEq(-1)$, which measures the speed of reversion to equilibrium, is markedly significant (-0.072086 , $p\text{-value} = 0.0000$), implying that approximately 72% of discrepancies from the long-term equilibrium are corrected annually, reflecting a relatively swift adjustment mechanism in response to short-term fluctuations. An R-squared value of 0.742643 signifies a robust model alignment with the data, validating the explanatory power of the examined variables in relation to their influence on real GDP per capita growth in Nigeria. The modified R-squared value of 0.690121, which takes into account degrees of freedom, indicates a model fit subsequent to adjusting for the number of predictors.

Table 4.5: Post-Estimation Tests Results

Test	Null Hypothesis	F-Statistic	Probability	Decision
Breusch-Godfrey Serial Correlation LM	H_0 : No serial correlation	1.084820	0.3472	Retain H_0
Breusch-Pagan-Godfrey Heteroskedasticity Test	H_0 : Homoscedasticity	1.668009	0.0916	Retain H_0
Jarque-Bera Normality Test	H_0 : Normally distributed	0.498773	0.779279	Retain H_0

Source: *Researcher's Computation using Eviews 12, 2026.*

The post-estimation diagnostic results presented in Table 4.5 indicate that the estimated ARDL model does not exhibit evidence of the major residual problems examined. The Breusch–Godfrey LM test reports an F-statistic value of 1.084820 and a probability value of 0.3472, which is greater than the 5% significance level. Therefore, the null hypothesis of no serial correlation fails to be rejected, suggesting that the residuals do not exhibit statistically significant serial correlation. Similarly, the Breusch–Pagan–Godfrey heteroskedasticity test produces an F-statistic value of 1.668009 and a probability value of 0.0916, which exceeds 0.05. Thus, the null hypothesis of homoskedasticity cannot be rejected, indicating no statistically significant evidence of heteroskedasticity in the residuals. The Jarque–Bera test reports a statistic of 0.498773 with a probability value of 0.779279. Since the JB value and the probability value exceed 0.05, the null hypothesis of normally distributed residuals cannot be rejected. Hence, there is no statistically significant evidence that the residuals depart from normality.

5. Conclusion and Recommendations

Conclusion

This study examined the effect of digital financial services on real GDP per capita growth in Nigeria using ATM, POS, mobile payment transactions, and internet penetration. The ARDL results reveal mixed short-run effects: internet penetration and POS transactions significantly promote real GDP per capita growth, while ATM and mobile payment transactions have significant negative effects. However, the long-run effects of all four indicators are statistically insignificant. The significant error-correction term indicates that about 72% of short-run deviations from long-run equilibrium are corrected annually. Overall, the findings suggest that digital financial services have greater short-run than long-run growth effects in Nigeria, highlighting the need to promote their productive use to achieve sustained economic growth and poverty reduction.

Recommendations

Based on the findings and conclusion drawn from this study, the following recommendations are made:

- i. The government should invest in reliable and affordable internet infrastructure, particularly in underserved communities, given the significant positive short-run effect of internet penetration on real GDP per capita growth.
- ii. Policies should encourage households and businesses to use mobile payments and ATM services for savings, investment, entrepreneurship, and other productive activities, given their negative short-run effects on real GDP per capita growth.
- iii. Government should improve POS accessibility, network reliability, and transaction affordability, particularly for MSMEs, given the significant positive short-run effect of POS transactions on real GDP per capita growth.
- iv. Digital-finance policies should be linked with employment, entrepreneurship, financial inclusion, and MSME-development initiatives to ensure that increased digital transactions translate into sustainable improvements in income and living standards.

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