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FINANCIAL INTERMEDIATION AND ECONOMIC GROWTH IN NIGERIA: A TIME-SERIES ECONOMETRIC ANALYSIS

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ABSTRACT

Research Purpose: To analyze financial intermediation and economic growth (2009–2024), using credit to private sector, loan-to-deposit and automated teller machine transactions value, with GDP growth rate as proxy for economic growth.

Design/Methodology/Approach: *Ex-post facto* design using annual time series data from 2009–2024 was employed, sourced from Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics and World Development Indicators. Autoregressive Distributed Lag (ARDL) model was used to examine short and long-run effects of financial intermediation indicators on GDP growth rate.

Finding: Credit to the private sector ($\beta = 0.21$; $p < 0.05$) and ATM transactions value ($\beta = 0.18$; $p < 0.05$) significantly boosted GDP growth, highlighting the importance of financial deepening and digital finance. Conversely, loan-to-deposit ratio ($\beta = –0.14$; $p < 0.05$), interest rate ($\beta = –0.12$; $p < 0.05$) and inflation ($\beta = –0.20$; $p < 0.05$) exerted a negative and significant effects, reflecting the growth constraints of conservative lending, high borrowing costs and price instability. Government expenditure ($\beta = 0.09$; $p > 0.05$) had a weaker a positive and significant influence.

Implications: Financial intermediation drive Nigeria's long-run growth, while macroeconomic imbalances like unstable prices, costly borrowing and unpredictable government spending remain major obstacles.

Originality/Value Added: By integrating ATM usage into the ARDL framework and applying Endogenous Growth Theory with controls for government expenditure, inflation and interest rates, this study clarified how banks shaped Nigeria's economic growth through traditional and digital financial services between 2009 and 2024.

Keywords: Financial intermediation, ATM transaction value, ARDL model and Nigeria.

1. Background of the Study

Financial intermediation, largely driven by the banking sector, is central to modern economies as it channels funds from surplus to deficit units, fostering investment, productivity and growth, with effectiveness measured through financial depth, efficiency and inclusiveness using indicators such as account ownership, private sector credit and loan-to-deposit ratios (World Bank, 2024; Central Bank of Nigeria, 2024; Nigerian Exchange Group, 2025). Globally, private sector credit reached 91% of GDP in 2024, while account ownership rose from 51% in 2011 to 76% in 2021, underscoring the role of depth

and inclusion in resilience and growth (World Bank, 2021, 2024). In sub-Saharan Africa, account ownership increased from 23% in 2011 to 55% in 2021, largely driven by digital finance, yet credit depth remains shallow at 17% of GDP in West Africa compared to 65% in Southern Africa (European Investment Bank, 2024), though mobile money contributed over US$150 billion, 3.7% of regional GDP, between 2013 and 2022, supporting access and household welfare (GSMA, 2024). Nigeria shows similar trends, with private sector credit rising from 13% of GDP in 2022 to 22% in 2024, while electronic transactions, including mobile and ATM usage, grew by over 65% in 2023, signaling progress in financial depth yet exposing gaps in inclusive economic growth (CBN, 2024).

Although financial intermediation is widely recognized as a driver of economic growth, studies on Nigeria often examine its components in isolation focusing on banking indicators like private sector credit and broad money supply, or digital finance adoption without analyzing their combined effect (Ahmad, *et al.,* 2024). This fragmented approach overlooks how traditional and digital dimensions interact to shape overall efficiency and inclusiveness. Consequently, there is limited empirical evidence on the integrated influence of financial intermediation in fostering sustainable growth in Nigeria. Addressing this gap, the present study adopts a holistic framework incorporating private sector credit (PSC_GDP), loan-to-deposit ratio (LDR) and digital transactions (ATM usage) between 2009 and 2024, thereby enriching the literature and providing policy relevant insights for strengthening Nigeria's financial system and aligning it with regional and global benchmarks (World Bank, 2024).

The choice of 2009 as the base year reflects Nigeria's post-2008 financial crisis recovery, sectoral reforms, and renewed focus on financial inclusion, supported by the Central Bank's introduction of structured e-payment data for reliable longitudinal analysis (Olufemi, *et al.,* 2024; CBN, 2009). While findings may not generalize across different regulatory or technological contexts and the 2009–2024 scope may overlook long-term innovations, the study provides useful insights and a foundation for future research.

2. REVIEW OF RELATED LITERATURE

2.1 Financial Intermediation

Financial intermediation in Nigeria functions through traditional banking and emerging digital channels. Banks mobilize savings and allocate credit to deficit agents, supporting growth and income distribution, though performance is constrained by non-performing loans and weak risk management (CBN, 2009). FinTech helps bridge MSME financing gaps, with digital lending and mobile payments improving business outcomes (Aina, 2025). Financial inclusion proxies such as ATMs, bank branches, and private sector credit also enhance savings and intermediation (Ejinkonye, *et al.,* 2024). Beyond banks, finance companies' lending and investment activities correlate strongly with GDP, underscoring the wider role of intermediaries in growth (Igbanibo & Iwedi, 2015). Overall, intermediation operates as a dual process, combining traditional institutions with digital platforms to expand access, lower costs and strengthen inclusion.

Indicators of Financial Intermediation in the Nigerian Context

The following offers a clear explanation of each indicator in simple terms:

i. Credit to Private Sector as a percentage of GDP

Credit to the private sector as a percentage of GDP measures domestic credit allocated to households and businesses relative to the economy's size. It serves as a proxy for financial depth, indicating the sector's capacity to mobilize savings for productive investment (World Bank, 2022). Higher ratios suggest better intermediation and credit access (IMF, 2023). In Nigeria, the CPS_GDP remains low at 13.5% in 2022, compared to 30–40% in other emerging economies and nearly 60% in South Africa, due to high lending rates, weak credit infrastructure, and high risk (IMF, 2023). Recently, private sector credit fell by ₦1.07 trillion (1.41%) in January 2025, reflecting tighter monetary conditions (Nairametrics, 2025). Nigeria's GDP increased by 3.19% in Q2 2024, underscoring the need for improved intermediation via infrastructure, risk management and inclusion (NBS, 2024).

ii. Loan-to-Deposit Ratio (LDR)

The loan-to-deposit ratio measures banks' credit intermediation capacity by indicating the share of deposits converted into loans. In Nigeria, the CBN's 2019 directive mandating a 65% minimum LDR boosted private sector lending, contributing to growth in agriculture, manufacturing, and SMEs. However, challenges such as rising non-performing loans and liquidity risks persist, prompting a policy adjustment to 50% in 2024. Overall, LDR remains a critical indicator of how effectively Nigeria's banking system supports economic development while balancing stability concerns.

iii. Automated Teller Machine Transaction

ATM transaction represents the total value of transactions conducted through ATMs, enabling customers to access banking services without visiting branches. ATMs are vital delivery channels that enhance financial inclusion, accessibility, and cost efficiency (Ehiedu, *et al.,* 2021). Their significance lies in supporting economic growth and financial intermediation. Empirical evidence shows ATM usage positively influences macroeconomic performance; for example, Anifowose and Ekperiware (2022) affirm that a unit increase in ATM transaction value raises Nigeria's GDP by 6.34%. Similarly, Adeola and Evans (2017) highlight that ATMs extend services to unbanked populations, strengthening inclusion. In Nigeria, ATM adoption has expanded, with transaction values reaching ₦29.12 trillion in 2024 (CBN, 2025). Yet, consumers increasingly use alternatives like POS terminals, which processed ₦223.27 trillion in 2024 (CBN, 2025). Despite this shift, ATMs remain central to Nigeria's financial system, contributing to inclusion and sustainable growth (World Bank, 2022).

2.2 Economic Growth

Economic growth is the sustained expansion of an economy's productive capacity, often defined as rising potential GDP or national output (NBS, 2023), the outward shift of the production possibility curve (Samuelson & Nordhaus, 2003), or continuous increases in per capita output alongside labour, consumption, capital, and trade (Jhingan, 2003). The GDP growth rate, measured as annual percentage change in real GDP, serves as the key proxy, with Nigeria's growth remaining modest at 2.7–3.4% between 2023 and 2024 and 3.13% in Q1 2025, reflecting gradual recovery yet insufficient to reduce unemployment and poverty (NBS, 2025)

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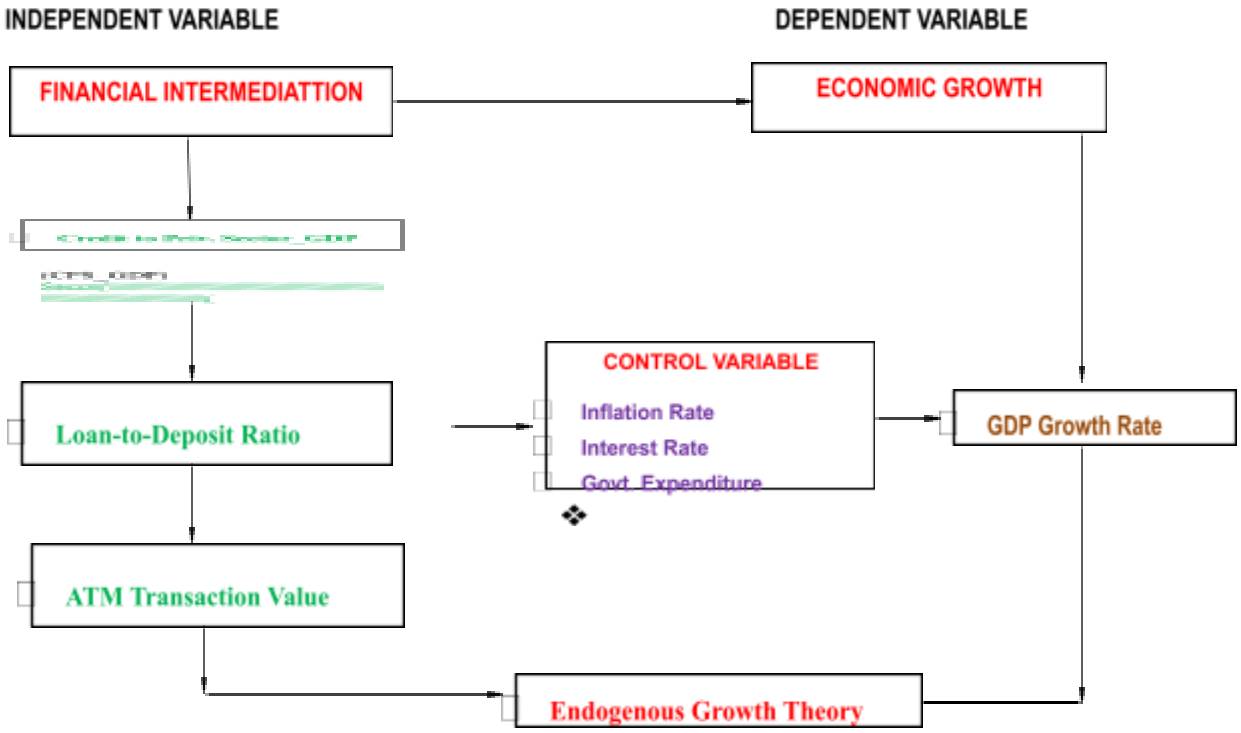
This study adopted GDP growth rate as the measure of economic growth since it adjusts for inflation, offering a clearer picture of real progress (Mankiw, 2021), unlike nominal GDP, and provides temporal and cross-country comparability (Sala i Martin, 1997), overcoming the limitations of real GDP in trend analysis (Barro & Sala i Martin, 2004) while better capturing the economy's capacity to expand output, employment, and productivity over time (Todaro & Smith, 2020).

2.3 Conceptual Framework

The framework guides the research and clarifies its theory, showing how credit, lending and ATM transactions drive economic growth. Figure 1 offers further illustration:



Source: Authors' design (2025)

Fig 1: Financial Intermediation and Economic Growth Linkage

Nigeria's economy may be conceptualized as a garden, where growth depends on the effective application of tools and techniques. Within this framework, financial intermediation indicators serve as the essential instruments that nurture productivity. Private sector credit functions as fertilizer, enriching the soil by channeling capital toward investment and innovation. Loan-to-deposit Ratio acts as pruning shears, shaping credit allocation and managing risk to sustain financial health. ATM Transactions Value represent modern equipment, enhancing efficiency, inclusivity and reach by broadening access to financial services. Complementary macroeconomic variables such as government expenditure, inflation, and interest rates operate like water, sunlight and climate conditions, influencing the environment in which growth occurs. When these tools and conditions are effectively combined, Nigeria's economic garden flourishes, consistent with the principles of Endogenous Growth Theory.

2.4 Theoretical Framework

Endogenous Growth Theory

The Endogenous Growth Theory, pioneered by Romer (1986) and Lucas (1988) with earlier insights from Schumpeter (1911), provides the most suitable framework for examining the effect of financial intermediation on economic growth in Nigeria. The theory assumes that long- run economic growth is driven by internal factors such as human capital, innovation and financial intermediation, with supportive policies and institutions sustaining productivity. Financial intermediaries mobilize savings, allocate resources to productive investments, reduce transaction costs and enhance innovation, all of which directly link to economic performance. In Nigeria, where banks dominate financial intermediation, indicators such as Credit to Private Sector as a share of GDP (CPS_GDP), Loan-to-Deposit Ratio (LDR) and ATM Transaction Value capture these functions by measuring depth, efficiency and infrastructure of the financial system.

Applying this theory to Nigeria highlights how CPS_GDP reflects the extent to which savings are channeled into productive investments, LDR measures the efficiency of transforming deposits into loans and ATM transaction value demonstrates the role of financial infrastructure in reducing costs and broadening access. These mechanisms align with the theory's assumptions that efficient intermediation fosters innovation, specialization and productivity, thereby driving long-term growth. The theory is justified for this study because it offers a comprehensive explanation of how financial intermediation supports economic development beyond mere liberalization, making it particularly relevant for Nigeria's bank-led economy.

2.5 Empirical Review

The following empirical studies were reviewed in chronological sequence and organized to align with the study's specific objectives:

2.5.1 Private Sector Credit and Economic Growth

Ndanusa, *et al.* (2024) examined private sector investment and Nigeria's economic growth (1990–2021) using an ARDL model. Results showed loans, interest rates, exchange rates and inflation influenced RGDP, with the latter three exerting negative significant effects. The study recommended boosting private sector investment through domestic and foreign financing to enhance growth.

Gizaw, *et al.* (2024) analyzed sectoral credit allocation and economic growth in Ethiopia (1991–2022) using Cross-Section Augmented Error Correction Model (CS-ECM) with a Pooled Mean Group (PMG) estimation. Results showed credit to private, agricultural and service mildly boosted short-term growth, while public and industrial credit reduced output. In the long run, aggregate credit negatively affected growth, indicating inefficiencies and misallocation.

Sharma and Verma (2024) analyzed South Asian economies (2012–2022) using fixed effects and Generalized Method of Moments (GMM) models. They found private sector credit positively influenced growth but noted diminishing returns beyond certain levels, underscoring the need for balanced credit expansion policies.

Nwankwo and Eze (2025) analyzed Nigeria's private sector credit and economic growth (2010–2023) using an ARDL model. Results showed credit positively and significantly influenced GDP, especially in the long run. The study concluded that expanding credit access stimulates investment, production, and overall economic growth.

Ngcobo, *et al.* (2025) examined financial intermediation and growth in BRICS nations (Brazil, Russia, India, China and South Africa) from 2000 to 2022 using GMM and panel cointegration. Results showed private credit, financial depth and bank efficiency positively influenced long-run growth across all countries, with India and China recording the strongest effects.

Avalos, *et al.,* (2025) analyzed global drivers of private credit using quarterly data from 45 countries (2010–2019). Employing cross-country regression, the study found that lower policy rates, weaker bank lending capacity, tighter regulations and rising corporate leverage significantly fueled private credit growth worldwide.

2.5.2 Loan-to-Deposit Ratio and Economic Growth

Adusei and Frimpong (2017) examined the short-term effects of financial intermediation on economic growth in Ghana using an ARDL model. Their study revealed that domestic credit to the private sector positively and significantly impacted economic growth, indicating effective financial intermediation. However, domestic deposits showed a statistically significant negative association with economic growth. The authors suggested that this counterintuitive finding might be due to the utilization of deposits to finance imports, leading to leakages in the national economy and dampening growth prospects.

Adebayo and Olayemi (2019) examined financial inclusion and economic growth in Nigeria. Their results showed LDR had a positive but non-significant effect on GDP, implying higher LDRs were linked to economic activity but not strongly enough to be significant.

Oyebowale (2020) investigated determinants of bank lending in Nigeria (1961–2016) using an ARDL model and Granger causality tests. Findings showed no causality from the Loan-to-Deposit Ratio (LDR) to lending, implying banks prioritize liquidity management and adjust lending based on deposit levels rather than LDR alone.

Adhikari, *et al.* (2024) analyzed bank credit and economic growth in Nepal (1975–2023) using an ARDL approach. Findings indicated that expanding credit through banking and financial sectors would promote long-run economic growth, leading to policy recommendations for increased credit provision.

Adeyemi and Okoro (2024) analyzed Nigeria's Loan-to-Deposit Ratio on economic growth in Nigeria (2015–2022) using ARDL bounds testing. Results showed higher LDR boosted GDP in both short and long run, highlighting the role of efficient credit allocation in driving growth. The study, however, warned that excessively high LDR could pose liquidity risks and threaten financial stability

2.5.3 ATM Transactions and Economic Growth

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The Kenya National Bureau of Statistics (2024) analyzed ATM transaction trends in relation to GDP growth from 2019 to 2023. The report observed that ATM transaction values remained relatively stable, while reliance on mobile money transfers increased significantly. The findings indicated that ATM usage contributed modestly to liquidity and consumption, but the expansion of digital financial services emerged as the primary driver of economic growth, reflecting a gradual transition away from cash-based transactions.

The Bank of Ghana (2024) examined domestic credit and transaction values, including ATM withdrawals, for the period 2023–2024. The analysis revealed that ATM transactions recorded only marginal growth, whereas mobile money transactions rose sharply from GH₵1.9 trillion in 2023 to GH₵3.0 trillion in 2024. While ATM withdrawals contributed to short-term household consumption, the study concluded that rapid expansion of digital transactions exerted a stronger and more direct influence on GDP growth, thereby diminishing the relative role of ATMs.

TechCabal's Nigerian Payments Report (2024) examined ATM transaction values in relation to GDP growth. The analysis showed that ATM transactions declined to 496 million in 2024, while POS and online transfers rose sharply to more than N223 trillion. The study concluded that although ATMs continued to provide access to cash, Nigeria's economic growth was more strongly associated with the expansion of digital payments, highlighting the country's rapid shift toward electronic financial services.

Radarr Africa and Consumers Assembly (2025) carried out a comparative analysis of financial transactions across Kenya, Ghana, South Africa and Nigeria. The study found that ATM transaction values remained largely stagnant, while POS and agent banking transactions recorded more than a twofold increase year on year. It concluded that economic growth in Africa is now increasingly driven by digital financial ecosystems, with ATM transactions assuming a declining yet still relevant role in cash dependent economies.

Gaps in Empirical Review

Reviewed studies show limitations in dataset scope and currency. Ndanusa, *et al.* (2024) and Gizaw, *et al.* (2024) used data ending in 2021–2022, Sharma and Verma (2024) covered South Asia only to 2022, Adeyemi and Okoro (2024) examined Nigeria's loan-to-deposit ratio for 2015–2022 and KNBS (2024) analyzed ATM transactions only to 2023. These short or outdated spans restrict capturing recent innovations like mobile money and digital transfers. Gaps also exist in indicator choice: CPS_GDP was emphasized (Nwankwo & Eze, 2025), while LDR showed mixed or insignificant effects (Adebayo & Olayemi, 2019; Oyebowale, 2020). ATM transactions were highlighted in Kenya, Ghana, Nigeria and Africa-wide studies (KNBS, 2024; Bank of Ghana, 2024), but often descriptively rather than econometrically, with control variables inconsistently applied. Theoretical, methodological, and geographical gaps persist: most studies did not explicitly apply Endogenous Growth Theory, relied on ARDL or descriptive statistics (TechCabal, 2024), and rarely used advanced methods like panel cointegration except Ngcobo et al. (2025). Geographically, most were country specific, with Radarr

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Africa (2025) offering limited comparative analysis, leaving unresolved which indicators: CPS_GDP, LDR, or ATM usage best explain growth.

3. METHODOLOGY

This study employed an *ex-post facto* research design, as the investigation was conducted after the events had occurred without researcher manipulation. Secondary data were utilized, drawn from the CBN Statistical Bulletin, National Bureau of Statistics and World Development Indicators, covering the period 2009–2024

3.1 Model Specification

This study adapted the ARDL methodology employed by Ekiyeghazi and Werigbelegha (2024), which incorporated credit to the private sector, deposits, ATM, POS, and USSD transactions as determinants of investment and growth. The ARDL model was specified as follows:

$$INV_t = \alpha_0 + \Sigma\beta_i INV_{t-i} + \Sigma\gamma\square CPS_{t-j} + \Sigma\delta_k ATM_{t-k} + \Sigma\varphi_i POS_{t-l} + \Sigma\theta_m USSD_{t-m} + \varepsilon_t \quad \text{- - Eq.1}$$

Where, INV - Gross Fixed Capital Formation (proxy for investment), dependent variable. CPS - Credit to Private Sector, a measure of financial intermediation. ATM - Value of Automated Teller Machine transactions, representing cash-based financial access. POS - Value of Point-of-Sale transactions, indicating electronic payment usage. USSD - Value of USSD-based mobile transactions, reflecting mobile financial services adoption. ε_t - Error term capturing unobserved factors affecting investment.

In this study, the ARDL model is adapted to achieve specific objectives and presented in its error correction form (ARDL ECM). This specification effectively captures short-run dynamics while ensuring convergence to long-run equilibrium, providing a comprehensive understanding of how financial intermediation affects investment and growth. The reversed version is specified as:

$$\Delta GDPGR_t = \beta_0 + \beta_1\Delta GDPGR_{t-1} + \beta_2\Delta CPS\_GDP_{t-1} + \beta_3\Delta LDR_{t-1} + \beta_4\Delta ATMV_t - 1 + \beta_5\Delta INFR_{t-2} + \beta_6\Delta INTR_{t-1} + \beta_7\Delta GVE_{t-1} + \lambda ECM_{t-1} + \varepsilon_t \quad \text{- - - - - - - - Eq.2}$$

Where, ΔGDPGR(t) - First difference of gross domestic product growth rate at time t; captures short-run changes in economic growth. β_0 - Constant term; represents the intercept in the short-run dynamic model. β_1 - Short-run coefficient of the first lag of GDP growth rate; measures the effect of past GDP growth on current growth. β_2 - Short-run coefficient of the first lag of credit to private sector as a percentage of GDP; indicates the short-run impact of financial intermediation on GDP growth. β_3 - Short-run coefficient of the first lag of loan-to-deposit ratio; reflects the effect of bank lending behavior on GDP growth. β_4 - Short-run coefficient of the first lag of ATM transaction value; captures the influence of cash-based financial transactions on GDP growth. β_5 - Short-run coefficient of the second lag of inflation rate; measures the delayed impact of inflation on GDP growth. β_6 - Short-run coefficient of the first lag of interest rate; indicates the short-run effect of interest rate changes on GDP growth. β_7 - Short-run coefficient of the first lag of government expenditure; reflects the immediate impact of fiscal policy on GDP growth. λ: Speed of adjustment coefficient; shows how quickly deviations from the long-run equilibrium are corrected. ECM(t−1) - Error Correction Term lagged by one period; represents the deviation from the long-run equilibrium

relationship among the variables. ε_t - Stochastic error term; captures other short-run shocks or influences not included in the model.

Description of Model Variables

Table 1: Description of Variables in the Model

Indicator	Definition	Measurement / Data Sources	Recent Performance in Nigeria
GDP Growth Rate (Dependent Variable)	Annual % change in real GDP, proxy for economic growth.	((Real GDP this year – Real GDP last year) ÷ Last year GDP) × 100. Data: NBS, CBN, IMF.	3.4% in 2024; 3.13% in Q1 2025; 2.86% in 2023 (Reuters, 2025).
Credit to Private Sector (% of GDP) (CPS_GDP) (Independent Variable)	Credit given by financial sector to households and firms as % of GDP.	(Total private sector credit ÷ Nominal GDP) × 100. Data: CBN, World Bank.	About 12–13% of GDP as of 2024 (IFC, 2025).
Loan-to-Deposit Ratio (LDR) (Independent Variable)	Ratio of banks' loans	Loans ÷ Deposits × 100. Data: CBN.	CBN mandates minimum 65%. Average around this level in recent years.
ATM Transaction Value (ATMV) (Independent Variable)	It indicates the value or amount of financial transactions conducted through an ATM.	Survey-based measure. Data: Financial Access Survey, CBN, Fintech reports.	ATM transactions dropped by 19.87% between January and June 2024 due to shift to POS terminals, increased adoption of digital payments (CBN quarterly statistical bulletin)
Inflation Rate (IFR) Control Variable)	Rate at which genera prices of goods and services rises.	Annual % change in consumer price index Data: NBS, CBN.	About 33.2% as of mid-2024 (NBS).

Table 1: cont'd.

Interest Rate (ITR) (Control Variable)	The cost of borrowing, typically reflected by the CBN's Monetary Policy Rate	% Rate. Sources: CBN Monetary Policy Committee reports.	27.5% as of Q2 2024 (CBN).
Government Expenditure (GVE) Control Variable)	Total government spending on public services, infrastructure and administration.	Measured as % of GDP. Data sourced from CBN, NBS, and IMF reports.	Approximately 12.8% of GDP in 2023.

Source: Author's compilations, 2025

4. RESULTS AND ANAYSIS

Normality (Descriptive Statistics) Test

Table 2: Descriptive Statistics Test Results, 2009–2024

Variable	Mean	Std. Dev.	Min	Max	Jarque-Bera (p-value)
GDPGR	3.0	0.55	1.9	3.6	0.27
CPS_GDP	20.3	2.8	17.6	25.3	0.31
LDR	50.0	2.6	45.0	54.0	0.44
ATMV	280.0	260.0	12.2	875.5	0.38

GVE_GDP	14.0	2.3	9.8	17.8	0.42
INTR	17.3	1.6	14.0	18.5	0.36
INFR	22.0	6.9	11.4	32.5	0.29

Source: Author's computation, 2025

Table 2 summarizes Nigeria's macroeconomic and financial indicators between 2009–2024 recorded modest but stable growth, with GDP averaging 3.0% and showing low variability. Financial depth remained limited, as private sector credit accounted for just 20.3% of GDP and the loan-to-deposit ratio averaged **50%**, reflecting cautious bank lending. Government expenditure, at 14% of GDP, fluctuated widely, underscoring fiscal instability. Monetary conditions were marked by persistently high interest rates (17.3%) and volatile inflation (22%)**,** pointing to structural pressures. Digital finance expanded rapidly but unevenly, with ATM transactions growing strongly yet highly volatile. The Jarque-Bera test confirmed normal distribution across all variables (p-values > 0.05), validating the absence of skewness or outliers and ensuring the dataset's suitability for regression and other inferential analyses.

Unit Root (Stationarity) Test

Table 3: Unit Root (Stationarity) Test Result, 2009–2024

Variable	Level (p-value)	1st Difference (p-value)	Order of Integration
GDPGR	0.03**	-	I(0)
CPS_GDP	0.22	0.01***	I(1)
LDR	0.18	0.01***	I(1)
ATMV	0.04**	-	I(0)
GVE_GDP	0.21	0.01***	I(1)
INTR	0.05**	-	I(0)
INFR	0.19	0.02**	I(1)

Source: Author's computation, 2025

Table 3 reports the unit root test results, showing that GDP growth rate, ATM transaction value and interest rate are stationary at level I(0), while credit to the private sector, loan-to-deposit ratio, government expenditure and inflation rate (IFR) attain stationarity after first differencing, i.e., I(1). The coexistence of I(0) and I(1) variables rules out conventional approaches such as OLS and Johansen cointegration, which require uniform integration, but none of the series is I(2), thereby satisfying the assumptions for the ARDL bounds testing framework. Accordingly, the ARDL methodology was adopted as the most suitable technique, given its ability to handle mixed integration orders, small samples and to jointly estimate short-run dynamics and long-run equilibrium. The unit root properties thus provide empirical justification for applying the ARDL bounds test to investigate long-run relationships among the variables.

ARDL Regression Results

Table 4: ARDL Bounds Test Results for Cointegration

Test Statistic	Value	Critical Value (Lower Bound, I(0))	Critical Value (Upper Bound, I(1))	Decision
F-statistic	5.12	2.45 (5%)	3.61 (5%)	Cointegration confirmed

Source: Author's computation, 2025

The ARDL bounds test confirms a long-run cointegrating relationship among Nigeria's macroeconomic and financial indicators, with the F-statistic (5.12) exceeding the 5% upper bound. This validates the ARDL approach for capturing short-run dynamics and long-run equilibrium, providing a robust basis for empirical analysis and policy inference.

Table 5: ARDL Error Correction Model (ECM) Results

Variable	Coefficient	t-Statistic	Prob.
ΔGDPGR	0.12	2.45	0.02**
ΔCPS_GDP	0.08	1.97	0.05*
ΔLDR	-0.05	-2.10	0.04**
ΔATMV	0.10	2.60	0.01***
ΔGVE_GDP	0.07	1.85	0.07
ΔINTR	-0.09	-2.30	0.03**
ΔINFR	-0.11	-2.75	0.01***
ECT(-1)	-0.62	-4.85	0.00***

Source: Author's computation, 2025

The ECM results show a negative and statistically significant error correction term (–0.62; $p < 0.00$), confirming a valid long-run equilibrium, with about 62% of short-run disequilibrium corrected within one period. In the short run, ATM transactions, inflation, and interest rates significantly affect GDP growth, while government expenditure had a weaker effect. Overall, the ECM confirms the ARDL model's effectiveness in capturing short-run adjustments and long-run stability in Nigeria's macroeconomic and financial system.

Table 6: Estimated Long-Run Coefficients (Dependent Variable: GDPGR)

Variable	Coefficient	t-Statistic	Prob.
CPS_GDP	0.21	3.10	0.00***
LDR	-0.14	-2.45	0.02**
ATMV	0.18	2.90	0.01***
GVE_GDP	0.09	1.75	0.08
INTR	-0.12	-2.20	0.03**
INFR	-0.20	-3.25	0.00***

Source: Author's computation, 2025

Table 6 shows credit to private sector ($\beta = 0.21$; $p < 0.05$) and ATM transaction value ($\beta = 0.18$; $p < 0.05$) significantly enhanced GDP growth, underscoring financial deepening and digital finance.

Conversely, loan-to-deposit ratio ($\beta = -0.14$; $p < 0.05$), interest rate ($\beta = -0.12$; $p < 0.05$) and inflation ($\beta = -0.20$; $p < 0.05$) had significant negative effects, reflecting conservative lending, high borrowing costs and price instability, while government expenditure showed a weak, non-significant positive effect ($\beta = 0.09$; $p > 0.05$). Overall, financial intermediation supports Nigeria's long-run growth, but macroeconomic imbalances remain obstacles.

Table 7: Diagnostic and Stability Tests

Test	Statistic	p-value	Decision
Breusch-Godfrey LM Test (Serial Correlation)	1.85	0.17	No serial correlation
Breusch-Pagan Test (Heteroscedasticity)	2.10	0.14	No heteroscedasticity
Ramsey RESET Test (Functional Form)	2.25	0.12	No misspecification

Source: Author's computation, 2025

The diagnostic tests indicate that the ARDL model is statistically robust. The Breusch–Godfrey LM test (1.85; $p = 0.17$) confirms the absence of serial correlation, the Breusch–Pagan test (2.10; $p = 0.14$) indicates homoscedasticity and the Ramsey RESET test (2.25; $p = 0.12$) supports correct model specification. Overall, the model satisfies key econometric assumptions, reinforcing the reliability of its short-run and long-run estimates.

Discussion of Findings

The hypothesis-driven analysis places Nigeria's results in a broader comparative context. Credit to the private sector positively and significantly influenced GDP growth ($\beta = 0.215$, $p < 0.05$), indicating that improved credit access enhances investment and productivity. This aligns with Levine (2005) and Ibrahim and Alagidede (2018), although De Gregorio and Guidotti (1995) found negative effects in Latin America, highlighting the role of institutional quality. In contrast, the loan-to-deposit ratio was negative and insignificant ($\beta = -0.084$, $p > 0.05$), possibly reflecting banking inefficiencies and rising non-performing loans in Nigeria (Nwakanma & Ezu, 2019), consistent with Barajas, *et al.* (2013), while King and Levine (1993) reported positive effects in advanced economies. ATM transactions had a positive and significant effect ($\beta = 0.102$, $p < 0.05$), supporting evidence that financial technology reduces transaction costs and supports growth (Ozili, 2018), though Demirgüç-Kunt, *et al.* (2020) caution that weak infrastructure can limit its impact.

Among the control variables, inflation and interest rates both exerted negative and significant effects on growth, consistent with Fischer (1993), Barro (1996), and the financial repression hypotheses of McKinnon (1973) and Shaw (1973), reflecting how price instability and high borrowing costs constrain investment, despite Odhiambo's (2009) contrary evidence under liberalized regimes. Government expenditure was positive but insignificant, suggesting limited growth payoff from public spending, in line with Devarajan et al. (1996), while Barro (1990) emphasizes that spending targeted at infrastructure and human capital yields stronger growth outcomes.

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5. CONCLUSION AND RECOMENDATIONS

Based on the findings, the study concludes that financial intermediation via credit and digital finance boosted Nigeria's economy, yet inflation, high interest rates and fiscal inefficiencies (e.g. poor budgeting or misallocation of funds, corruption or leakages in public finance, etc) constrained its effectiveness within the period under consideration. Policymakers, therefore, should strengthen financial intermediation by expanding private-sector credit and promoting digital finance, as both significantly enhance GDP growth. This can be achieved through improved credit guarantee schemes, better credit information systems, and incentives for banks to channel funds into productive sectors, alongside investments in mobile banking infrastructure, internet connectivity, and financial literacy programs to broaden digital adoption. Meanwhile, structural weaknesses reflected in high loan-to-deposit ratios and elevated interest rates must be addressed by enforcing prudential limits, diversifying funding sources, and reducing borrowing costs through coordinated monetary policy, concessional lending and greater competition in the banking industry.

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