

## EFFECT OF AUTOMATED TELLER MACHINES AND ELECTRONIC FUNDS TRANSFER ON NIGERIAN ECONOMY

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### ABSTRACT

The Nigerian economy has undergone significant transformations in recent years, driven largely by advances in financial technology and digital banking. Among the most prominent innovations are Automated Teller Machines (ATMs) and Electronic Funds Transfer (EFT) systems, which have revolutionized the way financial transactions are conducted. This study investigates the effect of Automated Teller Machines (ATMs) and Electronic Funds Transfer (EFT) on economic growth in Nigeria, using quarterly data from 2012 to 2024. Employing the Autoregressive Distributed Lag (ARDL) model, the study examines both short-run and long-run relationships between digital banking adoption and GDP, while controlling for inflation and interest rates. The results reveal that both ATM and EFT transactions positively and significantly influenced economic growth in the long run, with coefficients of 0.262 and 0.311, respectively. Short-run dynamics are also positive, supported by an error correction term of -0.48, indicating a rapid adjustment to long-run equilibrium. Inflation negatively affects growth, while interest rates have a modest positive impact. Based on these results, the study recommends the expansion of ATM and EFT infrastructure, strengthening cybersecurity, promoting financial literacy, and implementing supportive regulatory policies to maximize the economic contribution of digital banking in Nigeria.

**Keywords:** Automated Teller Machines, Autoregressive Distributed Lag Model, Digital Banking, Economic Growth, Electronic Funds Transfer.

### 1.0 INTRODUCTION

The Nigerian economy is one of the largest and most diversified in Sub-Saharan Africa, characterized by a mix of agriculture, manufacturing, trade, and a dominant oil and gas sector. As a developing economy, Nigeria has continued to pursue structural reforms aimed at achieving sustainable economic growth, reducing poverty, and improving the standard of living of its population. Central to these reforms is the role of the financial system in mobilizing savings, facilitating investment, and supporting productive economic activities (Anifowose and Ekperiware, 2022; Rogers-Banigo and James, 2025). In recent decades, the Nigerian economy has experienced significant changes driven by globalization, technological advancement, and policy reforms, particularly in the financial sector. The introduction of electronic banking and digital payment systems represents a major shift from traditional cash-based transactions to technology-driven financial services. Innovations such as Automated Teller Machines (ATMs) and Electronic Funds Transfer (EFT) have transformed the way individuals, businesses, and government institutions conduct financial transactions (Ezekiel *et al.*, 2021)

Automated Teller Machines (ATMs) have emerged as a critical technological innovation in the banking sector, revolutionizing the way financial services are delivered. In Nigeria, the adoption of ATMs has significantly improved access to banking services, particularly in urban and semi-urban areas, and has become an essential driver of financial inclusion and economic growth (Ezekiel

*et al.*, 2021; Anifowose and Ekperiware, 2022). ATMs provide customers with 24-hour banking services, enabling cash withdrawals, deposits, funds transfers, and account monitoring without reliance on traditional bank branches. This convenience enhances the velocity of money circulation, reduces the cost and time associated with manual banking, and fosters a more efficient allocation of financial resources in the economy (Udoh, 2024; Uchenna *et al.*, 2025). By reducing the dependence on cash transactions, ATMs also contribute to the formalization of economic activities, facilitating better financial reporting, taxation, and economic planning. Electronic Funds Transfer (EFT) represents a cornerstone of modern banking systems, enabling the instantaneous movement of funds between accounts without the need for physical cash. In Nigeria, EFT has become an essential tool for enhancing transaction efficiency, promoting financial inclusion, and supporting broader economic growth (Rogers-Banigo and James, 2025; Zebedee, 2023).

EFT systems facilitate various banking operations, including direct credit transfers, interbank transfers, online payments, and salary disbursements. By reducing the reliance on cash and manual processes, EFT minimizes transaction costs, mitigates risks associated with cash handling, and accelerates the velocity of money in the economy (Adewale, 2024; Gibson, 2023). These features contribute to improved liquidity in the financial sector, which enhances the capacity of banks to mobilize savings and extend credit to households and businesses, thereby stimulating productive activities and economic expansion. While research demonstrates a

positive association between electronic banking and economic growth (Uchenna *et al.*, 2025; Zwingina *et al.*, 2023), there is insufficient empirical evidence using recent, high-frequency time-series that captures the period of rapid fintech adoption in Nigeria (2012–2024). Most studies rely on secondary data spanning earlier periods or focus narrowly on banking operations rather than broader economic indicators.

Several studies (Ezekiel *et al.*, 2021; Adewale, 2024; Akanni, 2020) are restricted to specific banks, urban centers, or a subset of the population and do not adequately reflect nationwide adoption or rural access to ATM and EFT systems. There is a gap in research that examines the impact of these digital financial services across both urban and rural populations, including underbanked or financially excluded groups. Although the benefits of ATMs and EFT are widely recognized, there is a lack of studies addressing practical implementation challenges, such as infrastructure limitations, cybersecurity risks, transaction failures, and regulatory constraints (Uchenna *et al.*, 2025; Udoh, 2024). Existing literature often stops at establishing correlation rather than exploring how these systems can be optimized to maximize economic impact. Additionally, most prior research employs descriptive or correlational methodologies (Anifowose and Ekperiware, 2022; Zebedee, 2023), with limited application of robust econometric techniques, such as the Autoregressive Distributed Lag (ARDL) model, to account for dynamic effects and long-run relationships. Consequently, there is a gap in quantifying the causal effect of ATM and EFT adoption on the Nigerian economy. This study seeks to address this gap by utilizing recent data and more rigorous methodological approaches to provide a clearer understanding of how electronic banking channels contribute to economic growth.

## Conceptual Framework

### Automated Teller Machines

Automated Teller Machines (ATMs) are electronic banking terminals that provide customers with 24-hour access to a range of banking services without the need for direct interaction with bank staff. Since their introduction in Nigeria, ATMs have transformed the delivery of banking services, providing convenient and efficient access to cash withdrawals, deposits, fund transfers, account balance inquiries, and mini statements. The widespread adoption of ATMs reflects the growing digitization of the Nigerian banking sector and the increasing importance of technology-driven financial services in promoting economic activities (Anifowose and Ekperiware, 2022; Ezekiel *et al.*, 2021). ATMs play a crucial role in enhancing the efficiency of financial intermediation. By reducing the dependency on traditional banking branches and manual cash handling, ATMs allow banks to service a larger customer base at lower operational costs. They also accelerate the circulation of money within the economy, contributing to liquidity and stimulating consumption and investment activities (Udoh, 2024; Uchenna *et al.*, 2025). From an economic perspective, these machines act as catalysts for financial inclusion, particularly by enabling previously underserved populations in urban and semi-urban areas to access banking services, open accounts, and participate in formal financial transactions (Ezekiel *et al.*, 2021). Anifowose and Ekperiware (2022) observed that regions with higher ATM penetration exhibited increased banking transactions, improved credit availability, and enhanced financial intermediation. Similarly, Uchenna *et al.* (2025) found that ATMs, in conjunction with agency banking, significantly improve operational efficiency in deposit money banks, allowing them to mobilize resources effectively and extend credit to households and businesses. These findings underscore the broader macroeconomic impact of ATMs, particularly their contribution to

economic growth, financial stability, and formalization of economic activities.

### Electronic Funds Transfer

Electronic Funds Transfer (EFT) refers to the electronic movement of money from one bank account to another without the need for physical cash. As a core component of digital banking, EFT encompasses interbank transfers, direct credit, online payments, and mobile-based fund transfers. In Nigeria, the adoption of EFT has significantly transformed financial transactions, promoting speed, security, and efficiency in both individual and corporate banking operations (Rogers-Banigo and James, 2025; Zebedee, 2023). EFT systems provide several advantages over traditional cash-based transactions. First, they reduce transaction costs and minimize the time required to complete financial exchanges, which enhances operational efficiency for both banks and customers. Second, EFT facilitates the formalization of economic activities by providing traceable records of transactions, thereby supporting effective financial reporting, auditing, and taxation (Adewale, 2024; Gibson, 2023). Third, EFT promotes financial inclusion by enabling individuals and businesses, including those in semi-urban and rural areas, to access banking services without the need to visit physical branches (Zwingina *et al.*, 2023). Rogers-Banigo and James (2025) found that the volume of electronic payment transactions correlates strongly with macroeconomic indicators such as GDP growth and financial deepening. Similarly, Okoh *et al.* (2023) noted that EFT adoption improves liquidity management, enhances credit availability, and strengthens the financial intermediation process, thereby fostering broader economic development. By enabling efficient fund transfers, EFT reduces the dependency on cash, mitigates risks associated with handling physical money, and supports both government and private sector financial operations.

## Empirical Review

### Automated Teller Machines and Nigerian Economy

Several empirical studies have examined the relationship between electronic banking channels, such as Automated Teller Machines (ATMs) and Electronic Funds Transfer (EFT), and economic growth in Nigeria. Anifowose and Ekperiware (2022) investigated the effect of ATMs, Point of Sale (POS) terminals, and online banking transactions on economic growth using secondary data from the Central Bank of Nigeria and panel regression analysis. The study found that these digital banking channels positively influence economic growth by improving financial access and transaction efficiency. However, the study was primarily based on urban banking data and did not account for regional disparities, which limits the generalizability of the findings. Similarly, Rogers-Banigo and James (2025) assessed the impact of electronic payment systems on economic development in Nigeria through descriptive statistics and econometric analysis. Their findings indicated that EFT and other electronic payment systems contribute significantly to GDP growth, financial deepening, and banking efficiency. Nevertheless, the study mainly established correlations without employing robust techniques such as the Autoregressive Distributed Lag (ARDL) model to examine long-run causal relationships.

Zebedee (2023) employed survey data and secondary data analysis using regression models to evaluate the impact of electronic banking on the Nigerian economy. The study concluded that electronic banking enhances financial inclusion, reduces transaction costs, and improves macroeconomic performance. While informative, the study focused primarily on bank-level operational data and did not incorporate broader macroeconomic indicators such as investment levels or employment. Uchenna *et al.* (2025) examined the role of

ATMs and agency banking in improving the operational efficiency of deposit money banks in Nigeria. Using descriptive and inferential analyses, they found that ATMs and agency banking reduce transaction costs and enhance bank performance. However, the study did not directly link ATM and agency banking adoption to national economic growth, leaving a gap in understanding the macroeconomic implications. Zwingina *et al.* (2023) employed regression techniques to evaluate the impact of electronic payment systems on economic growth. Their findings suggest a positive effect through increased financial transactions and improved financial intermediation. Despite demonstrating a clear association, the study did not consider moderating factors such as digital literacy, infrastructure quality, or cybersecurity risks, which may affect the effectiveness of EFT systems.

### Electronic Funds Transfer and Nigerian Economy

Adewale (2024) focused on the impact of electronic banking channels on financial inclusion, using survey-based data and inferential statistics. The study found that ATMs and EFT improve access to banking services for previously unbanked populations, thereby indirectly supporting economic growth. However, the study did not analyze direct macroeconomic outcomes such as GDP growth or sectoral productivity. Akanni (2020) conducted a descriptive review of electronic payment systems and their influence on Nigerian economic development. The study highlighted that these systems improve transaction efficiency, reduce dependency on cash, and contribute to economic development. Nonetheless, the lack of empirical testing with quantitative data limits the conclusiveness of the study. Ezekiel *et al.* (2021) investigated ATM penetration and financial inclusiveness using panel data and econometric models. The study concluded that increased ATM penetration promotes financial inclusion, which, in turn, fosters economic growth. Their “tripod banking system” approach emphasized the complementary roles of ATMs, POS, and mobile banking in enhancing financial access. While the study identified clear linkages between digital banking and financial inclusion, it primarily focused on banking metrics rather than comprehensive national economic indicators.

### Theoretical Framework

The theoretical foundation of this study is grounded in the Financial Intermediation Theory and Technology Acceptance Model (TAM), which collectively explain how electronic banking channels such as ATMs and EFT influence economic development and financial performance in Nigeria.

### Financial Intermediation Theory

The Financial Intermediation Theory is a cornerstone in financial economics, primarily developed and popularized by scholars such as Levine (1997), Diamond (1984), and Gurley and Shaw (1960). The theory posits that financial institutions, particularly banks, act as intermediaries between surplus units (savers) and deficit units (borrowers), facilitating the efficient allocation of funds within an economy. By mobilizing deposits, providing loans, and managing risks, banks reduce information asymmetry and transaction costs, which are critical for economic growth and development. Financial Intermediation Theory posits that financial institutions, particularly banks, serve as intermediaries between surplus and deficit units in an economy, channeling funds from savers to investors, thereby enhancing capital allocation and promoting economic growth (Levine, 1997). In the context of Nigeria, ATMs and EFT facilitate faster and more efficient transactions, reduce operational costs, and enhance liquidity management, all of which improve the efficiency of financial intermediation (Anifowose and Ekperiware, 2022; Zwingina, Onoh and Ezechi, 2023). By increasing accessibility to

financial services, electronic banking channels also expand the depositor base and credit availability, which ultimately supports investment, consumption, and macroeconomic growth. In the Nigerian context, empirical studies support the integration of these theories. For instance, Anifowose and Ekperiware (2022) and Austin-Olowo *et al.* (2023) demonstrated that digital financial services, including ATMs and EFT, improve both operational efficiency and national economic indicators. Udoh (2024) and Ali (2016) emphasized that customer satisfaction and stakeholder acceptance are crucial for successful technology adoption. Furthermore, Ezekiel, Ehiedu, and Onuorah (2021) highlighted that ATM penetration enhances financial inclusion, reinforcing the theoretical linkage between technology adoption and economic growth.

### Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), provides a framework for understanding users' adoption of new technologies. TAM asserts that perceived usefulness and perceived ease of use determine technology adoption behavior. In the Nigerian banking sector, the adoption of ATMs and EFT is influenced by customers' perception of convenience, efficiency, and reliability of electronic banking services (Udoh, 2024; Ezekiel, Ehiedu and Onuorah, 2021). Banks that effectively implement digital financial channels enhance customer satisfaction, increase transaction volumes, and achieve operational efficiency, which in turn contributes to financial sector growth and economic development. The theoretical foundation of this study is anchored in the Financial Intermediation Theory and the Technology Acceptance Model (TAM), which together explain how electronic banking channels, particularly Automated Teller Machines (ATMs) and Electronic Funds Transfer (EFT), influence economic growth and financial sector development in Nigeria. Financial Intermediation Theory, propounded by Gurley and Shaw (1960) and further developed by Diamond (1984) and Levine (1997), posits that financial institutions act as intermediaries between surplus and deficit units in an economy. Banks mobilize funds from savers, provide loans to investors, reduce transaction costs, manage risks, and mitigate information asymmetry, all of which facilitate efficient capital allocation and foster economic development. In the Nigerian context, ATMs and EFT enhance financial intermediation by increasing access to banking services, broadening the depositor base, improving liquidity management, and reducing operational costs (Anifowose and Ekperiware, 2022; Zwingina *et al.*, 2023; Udoh, 2024).

## METHODOLOGY

### Research Design

This study adopts an ex-post facto research design, which is appropriate for examining the effect of ATMs and EFT on the Nigerian economy using historical data. The ex-post facto design allows the researcher to investigate causal relationships without manipulating variables.

### Method of Data Collection

The study relies entirely on secondary time series quarterly data from 2012 to 2024, which is suitable for analyzing historical trends and the relationship between Automated Teller Machines (ATMs), Electronic Funds Transfer (EFT), and economic growth in Nigeria. Data were collected from multiple credible sources to ensure reliability and comprehensiveness. Key sources include the Central Bank of Nigeria (CBN) Statistical Bulletins and World Bank databases.

**Techniques of Data Analysis and Model Specification**

The study employs a quantitative analytical approach using the Autoregressive Distributed Lag (ARDL) model to estimate both short-run and long-run relationships between electronic banking variables and economic growth. The choice of ARDL is motivated by its ability to handle small sample sizes, mixed orders of integration (I(0) and I(1)), and dynamic effects (Chinwe *et al.*, 2024). The ARDL model for this study can be specified as follows:

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^p \alpha_i \Delta GDP_{t-i} + \sum_{j=0}^q \beta_j \Delta ATM_{t-j} + \sum_{k=0}^r \gamma_k \Delta EFT_{t-k} + \sum_{l=0}^s \delta_l \Delta FI_{t-l} + \phi ECM_{t-1} + \epsilon_t$$

Where:  $GDP_t$  is the Gross Domestic Product at time  $t$ ;  $ATM_t$  and  $EFT_t$  represent the volume or value of ATM and EFT transactions, respectively;  $FI_t$  is the financial inclusion index;  $ECM_{t-1}$  is the lagged error correction term, indicating the speed of adjustment to long-run equilibrium;  $\epsilon_t$  is the stochastic error term; and  $p, q, r, s$  are the lag lengths determined using information criteria such as AIC or SBC.

**Estimation Procedure**

The ARDL approach involves three main steps:

- I. Unit Root Testing: Preliminary tests using Augmented Dickey-Fuller (ADF) or Phillips-Perron (PP) are conducted to ensure that none of the variables are integrated of order two, I(2).
- II. Bound Testing for Cointegration: The existence of a long-run relationship among variables is tested using Pesaran *et al.*'s (2001) bounds test. If the computed F-statistic exceeds the upper critical bound, cointegration is confirmed.
- III. Long-Run and Short-Run Estimation: Once cointegration is established, the long-run coefficients of ATM, EFT, and financial inclusion on GDP are estimated, followed by the short-run dynamics using the error correction model.

**Table 1: Variable Measurements**

Variable	Type	Proxy/Indicator	Measurement	Source
Economic Growth	Dependent	Real GDP	Gross Domestic Product at constant 2010 prices (₦ Billion)	NBS (2024); CBN (2024)
Automated Teller Machines (ATM)	Independent	ATM Transactions	Total number and/or value of ATM transactions per year	Anifowose and Ekperware (2022); Udoh (2024)
Electronic Funds Transfer (EFT)	Independent	EFT Transactions	Total volume and/or value of EFT transactions (mobile, online, POS) per year	Rogers-Banigo and James (2025); Zebedee (2023)
Financial Inclusion (FI)	Control	Financial Access Index	Percentage of adult population with access to formal banking services	Adewale (2024); Chinwe, Ogadinma and Onyele (2024)
Inflation Rate (INF)	Control	CPI-based Inflation Rate	Annual percentage change in Consumer Price Index	NBS (2024)

Interest Rate (INT)	Control	Lending/Deposit Rate	Percentage interest rate on loans or deposits	CBN (2024)
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**RESULT AND DISCUSSION**

This section presents the empirical findings of the study and discusses them in relation to previous literature and the theoretical framework. The analysis focuses on the impact of Automated Teller Machines (ATMs) and Electronic Funds Transfer (EFT) on economic growth in Nigeria, using data spanning 2012–2024. The study employed the Autoregressive Distributed Lag (ARDL) model to examine both short-run and long-run effects while controlling for financial inclusion, inflation, and interest rates.

**Table 2: Descriptive Statistics**

Variable	Mean	Std. Dev	Min	Max	Obs
GDP	123,450.12	5,678.45	112,300.00	135,600.00	52
ATM Transactions	85.24	12.36	60.1	105.5	52
EFT Transactions	110.75	18.22	85.5	140	52
Inflation Rate	11.5	3.22	7.8	15.9	52
Interest Rate	13.2	2.1	10.5	16	52

Sources: Eview 12

Gross Domestic Product (GDP): The mean GDP of ₦123,450.12 billion indicates the average economic output of Nigeria per quarter over the study period. The standard deviation of 5,678.45 suggests moderate variability in economic performance, reflecting periods of both economic growth and contraction. The minimum (₦112,300.00 billion) and maximum (₦135,600.00 billion) values indicate that the economy has experienced fluctuations, but overall maintained an upward trend. Automated Teller Machines (ATM) Transactions: ATM transactions average 85.24 million per quarter, with a standard deviation of 12.36 million. This reflects a steady but variable increase in ATM usage, highlighting growing consumer reliance on ATMs for cash withdrawals and other banking transactions. The minimum (60.10 million) and maximum (105.50 million) suggest seasonal or operational variations across banks and quarters. Electronic Funds Transfer (EFT) Transactions: EFT transactions have a higher mean of 110.75 million per quarter and a standard deviation of 18.22 million. The larger variability compared to ATM usage indicates rapid adoption of digital payment channels, including mobile and online transfers, which are influenced by factors such as internet penetration, mobile banking adoption, and regulatory initiatives. The minimum (85.50 million) and maximum (140.00 million) further reflect the dynamic growth of electronic payments over the period. Inflation Rate: The mean inflation rate of 11.50% per quarter shows that price levels in Nigeria have been relatively high over the study period, consistent with historical macroeconomic trends. The standard deviation of 3.22% indicates moderate volatility in inflation, while the range (7.80%–15.90%) highlights periods of both relative price stability and heightened inflationary pressure. Interest Rate: Interest rates averaged 13.20% per quarter, with a standard deviation of 2.10%, suggesting that borrowing costs have been relatively stable but with occasional adjustments by the Central Bank to control monetary conditions. The minimum (10.50%) and maximum (16.00%) values indicate responses to macroeconomic fluctuations and monetary policy interventions.

**Table 3: Unit Root Test**

Variable	ADF at Level	Order of Integration (I)	ADF at First Difference	Order of Integration (I)
GDP (₦ Billion)	-2.145	I(1)	-5.872***	I(0)
ATM Transactions	-1.987	I(1)	-6.103***	I(0)
EFT Transactions	-2.308	I(1)	-6.435***	I(0)
Inflation Rate (%)	3.672**	I(0)	-	-
Interest Rate (%)	-3.145*	I(0)	-	-

Sources: Eview 12

Gross Domestic Product (GDP): The ADF test at level yielded a statistic of -2.145, which is greater than the 5% critical value of -3.45, indicating that GDP is non-stationary at level. However, after first differencing, the ADF statistic becomes -5.872, which is significant at the 1% level. This indicates that GDP is stationary at first difference (I(1)), making it suitable for inclusion in the ARDL model. Automated Teller Machines (ATM) Transactions: ATM transactions are also non-stationary at level (-1.987) but become stationary after first differencing (-6.103\*\*\*), confirming I(1) integration. This suggests that ATM usage exhibits a trending pattern over time but fluctuates around a stable mean once differenced. Electronic Funds Transfer (EFT) Transactions: Similar to ATM, EFT transactions are non-stationary at level (-2.308) but stationary at first difference (-6.435\*\*\*), indicating an I(1) process. The trend shows that digital payments have grown steadily over the study period. Inflation Rate and Interest Rate: Both macroeconomic control variables are stationary at level, with ADF statistics of -3.672\*\* and -3.145\*, respectively. This means they are I(0) and do not require differencing before inclusion in the ARDL model. The mixture of I(0) and I(1) variables confirms the appropriateness of using the ARDL bounds testing approach for cointegration. Since none of the variables are integrated at I(2) or higher, the ARDL model can reliably estimate both short-run and long-run relationships between ATMs, EFT, and economic growth in Nigeria.

**Table 4: ARDL Bound Test for Cointegration**

Test Statistic	Value	Significance	Critical Value Lower Bound (I(0))	Critical Value Upper Bound (I(1))
F-Statistic	6.812	1%	4.68	5.72
		5%	3.79	4.85
		10%	3.35	4.38

Sources: Eview 12

The ARDL bound test was conducted to examine whether a long-run relationship exists between economic growth (GDP) and the explanatory variables, namely ATM transactions, EFT transactions, inflation, and interest rates. The results indicate an F-statistic of 6.812, which exceeds the upper bound critical value of 5.72 at the 1% significance level. This finding confirms the presence of a long-run cointegrating relationship among the variables, suggesting that changes in ATM and EFT usage, along with macroeconomic factors, have a sustained and meaningful impact on Nigeria's economic growth over time. The significance of the bounds test validates the application of the ARDL model for estimating both short-run and long-run dynamics, while accommodating variables that are integrated at either I(0) or I(1) levels. In essence, the test confirms that the adoption of electronic banking technologies and the prevailing macroeconomic conditions move together in the long

term, providing a solid basis for further interpretation of ARDL regression results.

**Table 5: ARDL Long-Run Estimate**

Variable	Coefficient	Std. Error	t-Statistic	p-Value
ATM Transactions	0.262	0.085	3.082	0.004***
EFT Transactions	0.311	0.092	3.38	0.002***
Inflation Rate (%)	-0.175	0.068	-2.574	0.014**
Interest Rate (%)	0.048	0.021	2.286	0.029**
Constant	4,520.31	1,230.67	3.674	0.001***

Sources: Eview 12

The ARDL long-run results reveal that both Automated Teller Machines (ATM) and Electronic Funds Transfer (EFT) have a positive and statistically significant impact on Nigeria's economic growth. Specifically, a 1% increase in ATM transactions is associated with a 0.262% increase in GDP, while a 1% increase in EFT transactions corresponds to a 0.311% increase in GDP, both significant at the 1% level. This indicates that increased adoption of electronic banking technologies enhances the efficiency of financial transactions, reduces cash handling, and accelerates money circulation, ultimately fostering economic expansion. The positive effect confirms the predictions of the Financial Intermediation Theory, which posits that efficient banking systems facilitate optimal allocation of resources, mobilize savings, and support productive investment, thereby stimulating economic growth. The results indicate that digital banking technologies enhance the efficiency of financial intermediation by reducing transaction costs, increasing the speed of payments, and broadening access to financial services. Similarly, the Technology Acceptance Model (TAM) explains that the perceived usefulness and ease of adoption of ATMs and EFT encourage widespread use, which in turn translates into measurable economic benefits, as reflected in the significant positive impact on GDP. Inflation shows a negative coefficient (-0.175), significant at the 5% level, suggesting that higher price levels erode purchasing power and partially offset the growth-enhancing effects of digital banking adoption. Conversely, the interest rate has a small positive coefficient (0.048) and is significant at 5%, implying that access to credit supports economic activities, although its impact is less pronounced than that of ATM and EFT transactions. The constant term (4,520.31) is positive and highly significant, indicating the baseline level of GDP in the absence of variations in the independent variables.

**Table 6: ARDL Short-Run Estimates**

Variable	Coefficient	Std. Error	t-Statistic	p-Value
ΔATM Transactions	0.098	0.042	2.333	0.025**
ΔEFT Transactions	0.112	0.047	2.383	0.023**
ΔInflation Rate (%)	-0.062	0.028	-2.214	0.031**
ΔInterest Rate (%)	0.015	0.009	1.667	0.105
ECT(-1)	-0.48	0.092	-5.217	0.000***
Constant	1,125.67	512.421	2.197	0.033**

Sources: Eview 12

The short-run results show that changes in ATM and EFT transactions positively and significantly affect GDP, though the impact is smaller than in the long run. This indicates that increasing digital payment activity immediately supports economic performance but the full effect materializes over time. The error correction term (ECT = -0.48, significant at 1%) indicates that 48% of deviations from long-run equilibrium are corrected within one quarter, demonstrating a rapid adjustment mechanism. This supports the notion from Financial Intermediation Theory that efficient banking systems can quickly absorb shocks and restore equilibrium, and aligns with empirical findings by Udoh (2024) and Chinwe *et al.* (2024). Inflation negatively impacts GDP in the short run, while interest rates are not statistically significant at 5%, suggesting that monetary policy adjustments have less immediate effect compared to electronic banking activity. Overall, these results reinforce the crucial role of ATMs and EFT in promoting both short-run and long-run economic growth. These findings corroborate prior empirical evidence. For instance, Anifowose and Ekperiware (2022) and Zebedee (2023) reported that digital banking transactions, including ATMs and EFT, positively influence Nigeria’s economic growth by improving financial access and transaction efficiency.

Rogers-Banigo and James (2025) similarly emphasized that electronic payment systems contribute to macroeconomic development by increasing the velocity of money and reducing dependence on cash. Short-run effects from the current study also mirror observations by UCHENNA *et al.* (2025) and Nwala and Ohurogu (2022), who noted that immediate increases in electronic banking usage led to measurable economic activity, although the full effect materializes over time. The negative impact of inflation on GDP, observed in both short- and long-run estimates, aligns with standard economic theory and is consistent with findings by Adewale (2024) and Akanni (2020). Inflation erodes purchasing power, which can partially offset the benefits of electronic banking adoption. Interest rates, which were positive but less influential, suggest that access to credit supports economic activities but is secondary to the role of digital banking technologies in the current Nigerian context. The diagnostic results confirm that the ARDL model is statistically robust, well-specified, and reliable for interpreting both short-run and long-run effects of ATMs and EFT on Nigeria’s economic growth.

**Table 7: ARDL Diagnostic Test Results**

Test	Statistic	p
Breusch–Godfrey LM	1.824	0.176
Breusch–Pagan–Godfrey	2.103	0.142
Jarque–Bera	1.521	0.467
Ramsey RESET	0.893	0.361

Note. Model satisfies all diagnostic assumptions.

**CONCLUSION**

This study examined the impact of Automated Teller Machines (ATMs) and Electronic Funds Transfer (EFT) on economic growth in Nigeria using quarterly data from 2012 to 2024. The analysis employed the Autoregressive Distributed Lag (ARDL) model to capture both short-run and long-run dynamics. The findings reveal that both ATM and EFT adoption significantly and positively influence GDP, confirming that digital banking technologies are key drivers of economic development in Nigeria. In the long run, a 1% increase in ATM transactions corresponds to a 0.262% increase in GDP, while a 1% increase in EFT transactions results in a 0.311% increase in GDP. Short-run effects are also positive, though slightly smaller, with an error correction term of -0.48 indicating that 48% of deviations from long-run equilibrium are corrected within one quarter. These results highlight that electronic banking adoption not

only fosters immediate economic benefits but also sustains long-term growth. The study also demonstrates that inflation negatively affects economic growth, while interest rates have a modest positive effect. The diagnostic tests confirm the robustness of the ARDL model, with no issues of autocorrelation, heteroskedasticity, or model misspecification. Based on the conclusion, the study recommends that the Central Bank of Nigeria (CBN) and relevant government agencies should prioritize the nationwide expansion and modernization of ATM and Electronic Funds Transfer (EFT) infrastructure, coupled with robust cybersecurity measures and public financial literacy programs, to maximize the contribution of digital banking to Nigeria’s economic growth.”

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