IMPACT OF ELECTRONIC BANKING SERVICES ON COMMERCIAL BANK PERFORMANCE IN NIGERIA

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ABSTRACT

This study focuses on the impact of e-banking services on commercial bank performance (LR) in Nigeria. Monthly time series data were obtained from central bank of Nigeria (CBN) statistical database for the period 2012M01 – 2023M12. Data obtained were analyzed using an Autoregressive and Distributed Lag (ARDL) model. The variables include (LR) liquidity ratio (dependent variable), while the (independent variables) include Automated teller machine (ATM), point of sale (POS) and mobile banking (MB). The overall result from the data analysis shows that there is a statistical and positive impact of e-banking services (ATM, POS and MB) on commercial bank performance (LR) in Nigeria and a causality relationship between e-banking services and bank performance. The study recommends that commercial banks must accelerate digital transformation by investing in advance technologies such as blockchains, improving mobile banking and strengthening cybersecurity. To maintain growth, Nigerian banks must embrace agility, collaboration and customer-centre solutions to counter FinTech competition effectively.

Keywords: *E-Banking, Mobile Banking, Point-of-Sale, Automated Teller Machine, Liquidity Ratio*
JEL Classification: G21, O33 C32

1. Introduction

The Nigerian economy has undergone significant transformations in recent years, with the rapid adoption of electronic banking services and the evolving performance of the banking sector. While there is an increasing trend in the utilization of e-banking services such as automated teller machines (ATMs), point of sale (POS) transactions, and mobile banking, the implications of these advancements on the economic growth of the country remain relatively understudied (Deekor 2021). Additionally, as the banking sector plays a vital role in channelling financial resources and driving economic development, understanding the link between bank performance, E-banking adoption, and their collective influence on economic growth is crucial.

Electronic banking should be a system where most of the banking services are carried out without stepping a foot into the banking hall.

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This means that a perfect internet and mobile banking system is there to satisfy the need of all internet and mobile banking users. The ATM and POS systems should be readily available to satisfy all deposit and withdrawal needs. But this happens only in an ideal World. This would enhance the role of banks as financial intermediaries. The intermediation efficiency entails financial intermediaries being able to harmonize the transfer of funds from the surplus spending units to the deficit spending units and vice versa (Raymond et al 2022).

Similarly, banks are often faced with system redundancy due to rapid technological changes resulting to excessive costs hence, lower profitability. The issue of insecurity and lack of privacy occasioned by cybercrime is another problem militating against the banks from milking the full benefits offered by e-banking. These could lead to financial and capital losses due to inaccurate processing of transactions, data privacy and confidentiality, unauthorized access or intrusion to financial institutions' systems and transaction, which will in turn, take a heavy toll on their profitability and overall performance (Naeem and Ozuem 2021). Customer complains as regards, malfunctioning Automated Teller Machines (ATMs), network downtime, cyberattack and fraud, non-availability of financial service, payment of hidden cost of electronic banking and maintenance, mandatory acquisition of ATM cards, and non-acceptability of domestic cards for international transaction amongst others. Despite the high volume of transactions carried out through electronic channels, can we conclude that electronic banking has strong relationship with bank performance?

Evidence from studies by (Raymond et al. 2022; Chibueze et al., 2013; and Naeem & Ozuem 2021) used profitability, return on equity (ROE), and liquidity ratio (LR) as stand-ins for bank performance. In order to solve this issue, our study modified the electronic channels that other authors employed to confirm previous findings.

The studies reviewed under empirical literature mostly employed methodology without the test of the state of the variables. Such include the Ordinary Least Square. Most studies on the e-banking were based on the analysis of problems and prospects; the question of economic impact has received less attention.

This research thus aimed at filling this gap by extending the existing literature with Nigeria as a scope. The rapid increase in the volume and value of electronic banking devices becomes imperative to ask: How has e-banking impacted on growth of commercial banks in Nigeria? Can e-banking lead to long-term growth in Nigeria's commercial bank? Is there any causal relationship between e-banking and bank performance given that the recent development in the banking sector? The objectives of this study are to determine the impact of e-banking on bank performance, to determine long-run and short-run relationships and the causal between e-banking and bank performance in Nigeria.

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2. Literature Review

2.1 Conceptual Literature

2.1.1 E-banking

E-banking may be defined as that banking system which aims at reducing (not eliminating) the amount of physical cash (notes and coins) circulating in the economy, whilst encouraging non-cash (little cash) and more electronic-based transactions (payment for goods, services, transfers etc.) through non-physical cash means. In other words, it is a combination of e-banking and cheque-based systems. The aim of e-banking is to encourage as best as possible the use of "less cash" or limited amount of cash for business transactions (Naeem and Ozuem 2021).

2.1.2 Bank Performance

By bank performance, generally it implies whether a bank has fared well within a trading period to realize its objectives. One of the documents that explain this is presumably the published financial statements. According to Chibueze et al., (2013) a fair evaluation of any bank's performance should start by evaluating whether it has been able to achieve the objectives set by management and stockholders. For the purpose of this study, profitability indicators, precisely the Return on Equity Capital (ROE) and the returns on Assets (LR) are used to assess bank performance. These ratios are indicators of management efficiency, and rate of returns. According to Okonkwo (2022), these profitability measures vary substantially over time and from one banking market to another.

The major tools of e-banking as used in the Nigeria include the following;

2.1.2.1 ATM

This stands for Automated Teller Machine, is an electronic telecommunication device that enables the customers of financial institution to perform financial transaction without the need of human cashier, clerk, or bank teller, this transaction is aided by the use of a card. An ATM card is a payment card provided by financial institution to its customers, which enables the customer to use an ATM for transactions. As a tool for e-banking it limits the amount of physical cash accessible owing to the fact the there is a limit to cash withdrawal per day.

2.1.2.2 Internet Banking Transactions

The Federal Reserve Board of Chicago's Office of the Controller of Currency – OCC Internet Banking Handbook, (2001) as cited in Agbonifo, et, al. (2012) describes Internet Banking as "the provision of traditional banking services over the Internet". It is a product that is Module and in-built on the new Banking Application, implemented by banks to serve the Internet Banking needs of bank's customers.

2.1.2.3 Mobile Banking

This product offers Customers of Banks access to services as they go. Customers can make their transactions anywhere. Services such as account balance, transaction enquiries, account verification, bill payments, electronic fund transfer, transaction history, and other customer services are all deliverables via mobile phones.

2.1.2.4 Point-of-Sale (POS) Machine

A Point-of-Sale machine is the payment device that allows credit/debit cardholders make payments at sales/purchase outlets. It allowed customers to perform the following services: retail payments, e-banking payments, cash back balance enquiry, airtime vending, printing mini-statement, etc.

2.2 Theoretical Literature

2.2.1 The Solow-Swan Growth Theory

This theory was propounded by Solow and Swan (1956). The neo-classical stated that technology, labour and capital are the major determinants of growth in output, and they came up with a growth model, which states that technological change or scientific innovation replaces investment as the major factor thus explaining growth in the long-run. The neo-classical stated that the level of technological change is determined exogenously, i.e., it is independent of all other factors including inflation. Ogbonna & Sunday, (2020) argued that the neoclassical economic theory of growth is built on the principle of diminishing returns of labour and diminishing returns of capital separately, and constant returns to both factors jointly.

2.2.2 Technology Acceptance Theory (TAT)

This model was propounded by Fred Davis in 1989. The prediction of acceptance of Information technology & the organizational usage by the users was the initial design of the model. It was argued in the model that acceptance by the user is determined by two (2) important beliefs, these are, perceived ease of use & perceived usefulness. Perceived usefulness (U) was defined as the extent which it is believed by the person that a specific technology will improve his/his job performance, on the other hand, perceived ease of use (EOU) was defined as the degree to which it is believed by a person that using a technology will be easy Davis (1989). It was posited further that the attitude of the customers as regards to a new technology is affected by the perceived ease of use and how easy it is to use. To measure the perceived usefulness, it is carried out in scale of if work is carried out faster, improved performance, increased productivity, usefulness & effectiveness. The perceived ease of use is measured on if the technology is easy to learn, understandable & clear, easy to be skilful on its usability easy to remember & controllable.

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2.3 Empirical Literature

Gbanador et al. (2022) examined the influence of electronic banking systems (e-banking) on performance of deposit money banks (DMBs) in Nigeria. The study adopted an ex-post facto research design and utilized secondary data collected from the Central Bank of Nigeria's statistical bulletin. Monthly time series data spanning 2019 to 2021 served the study. The Augmented Dickey Fuller (ADF) and Phillips-Perron were used to test for stationarity. However, the result from the long-run analysis revealed that ATM and POS positively and insignificantly influence performance of DMBs in Nigeria while Mobile banking has a positive and significant impact on DMBs' performance. The result further reveals evidence of long-run relationship between e-banking and DMBs' performance, and concludes that e-banking influences performance of DMBs in Nigeria.

In a study, Raymond et al. (2022) examined the impact of Net interest margin on Banks' performance in Nigeria within the period of 2009 to 2017. The study adopted net interest margin to represent performance, and ATM, POS, WB and MB were used as dimensions of e-banking. The findings via the Johansen cointegration test reveals a long-run relationship between e-banking and Banks' performance in Nigeria.

Okonkwo and Ekwueme (2022) examined the effect of e-payment on financial performance of DMBs in Nigeria using time series data spanning 2009 to 2019. LR was used as a proxy for the dependent variable while ATM and POS were used as proxies of the independent variable. The findings revealed that the ATM has positive but insignificant effect on LR while the POS has a negative but insignificant relationship on LR.

Deekor (2021) assessed e-banking and deposit money bank's performance in Nigeria using quarterly data spanning 2010 to 2018. Net interest margin was used as proxy for banks performance while ATM, POS, mobile banking and web pay were used as proxies for e-banking. The study found that ATM, POS and web pay do not have significant effect on Net interest margin while mobile banking have a positive and significant relationship with net interest margin.

Thankgod, et. al. (2019) investigated the impact of electronic payments on DMBs financial performance in Nigeria. Automatic teller machines, internet banking, and point-of-sale (POS) were used to measure electronic banking, while DMBs profitability was used to measure financial performance. The study found that ATMs do not contribute to bank profitability and are not statistically significant to bank profitability. However, POS is statistically significant and has a positive contribution to bank profitability. Internet banking on the other hand is statistically significant and has a positive contribution to bank profitability.

3. Methodology

This research adopted a quantitative research design as it collected quantitative data that is precise and based on measurement and analysed using statistical and econometric techniques. Monthly timeseries data that covers the period from 2012 January to 2023 December obtained from central bank of Nigeria (CBN) statistical database.

The analysis procedure for this study was carried out in three phases. To begin with the pre-estimation test, Phillips-Perron and Augmented Dicky-Fuller unit root test was conducted. This becomes expedient to avoid spurious regression and ensure that none of the data series becomes integrated of order 2. In addition, a Johansen cointegration test was conducted to show cointegrating relationships; prior to the test, an appropriate lag length was chosen through lag length criteria. Furthermore, the ARDL model was used to analyse the long-run and short-run coefficients of the variables. Lastly, CUSUM and CUSUM of squares were plotted to show recursive residuals for the stability of the model, and the Breusch-Godfrey serial correlation LM test was employed to indicate that the estimated variances of the regression coefficient were reliable and not biased.

3.1 Model specification

The specification of an ARDL equation for this model to capture the impact of e-banking on bank performance in Nigeria started from a functional relationship in equation 1

$$LR = f(LATM, LPOS, LMB) \ldots\ldots\ldots\ldots\ldots (1)$$

we use the Autoregressive Distributed Lag framework, which incorporates lagged values of both the dependent and independent variables. The general (p, q_1, q_2, q_3) ARDL equation for this relationship is built in equation 2 below;

$$LR_t = \beta_0 + \sum_{i=1}^{p} \psi_i LR_{t-i} + \sum_{j=0}^{q_1} \alpha_j LATM_{t-j} + \sum_{k=0}^{q_2} \gamma_k LPOS_{t-k} + \sum_{l=0}^{q_3} \delta_l LMB_{t-l} + \epsilon_t \ldots\ldots\ldots (2)$$

Dependent variable: LR_t (current period) with p autoregressive lags $(LR_{t-1}, LR_{t-2}, \ldots, LR_{t-p})$.

Independent variables:

LATM with q_1 distributed lags $(LATM_t, LATM_{t-1}, \ldots, LATM_{t-q1})$.

LPOS with q_2 distributed lags $(LPOS_t, LPOS_{t-1}, \ldots, LPOS_{t-q2})$.

LMB with q_3 distributed lags $(LMB_t, LMB_{t-1}, \ldots, LMB_{t-q3})$.

Coefficients:

ψ_i: Short-run effects of past LR values.

α_j, γ_k, δ_l: Short-run effects of LATM, LPOS, and LMB respectively

Error term

ϵ_t~ iid (0, σ²).

Table 1: Sources and description of the Variables

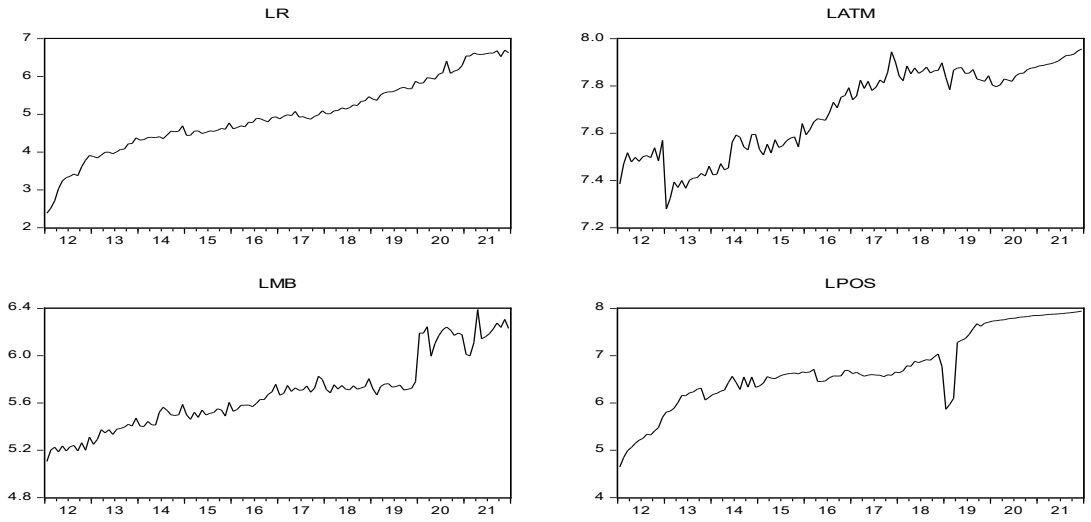
Variable	Description	Source
LR	Liquidity Ratio	CBN
LATM	Value of transactions on Automated Teller Machines	CBN
LPOS	Value of transactions on Point-of-sale operations	CBN
LMB	Value of transactions on mobile banking payments	CBN

4. Results and Discursions

4.1 Graphical Presentation of the Variables

The graphical plots of the time series variables covering the period 2012 to 2021 are depicted in Figure 4.1. the line graphs revealed that all the variables have an intercept and trend and all the variables are trending to upward and downward over time.

Figure 1: Graphical Plots of the Variables



4.2 Unit Root Test

The Philips-Perron and Augmented Dicky-Fuller unit root tests were performed with the trend and intercept at level and at first difference, as shown in Table 4.1 below, in order to determine stationarity.

Table 2: Phillips-Perron and Augmented Dickey-Fuller unit root test

	Phillips-Perron			Augmented Dickey-Fuller		
Series	Level	1st Diff	Order of int.	Level	1st Diff	Order of int.
LR	-4.6166***	-12.7224***	I (0)	-4.5920***	-12.7284***	I (0)
LATM	-3.2002*	-17.0393***	I (0)	-2.2179	-10.9618***	I (1)
LPOS	-3.3705*	-10.6161***	I (0)	-3.4392*	-8.6868***	I (0)
LMB	-4.2195***	-22.0788***	I (0)	-4.3226***	-9.4170***	I (0)

*Source: Researcher's Computation using E-views 10; Note: ***, ** and * denote level of significance at 1%, 5 % and 10% respectively.*

The statistic value is greater than the critical values, we do not reject the null hypothesis of a unit root at conventional test sizes. As shown in Table above, LR, LPOS and LMB were stationary at level in the both test conducted and LATM is stationary at first difference making the variables a mixture of I(0) and I(1).

4.3 Johansen cointegration and lag length selection criterion

Considering the research variables had a mixture of integration I(0) and I(1), for Augmented Dickey-Fuller unit root tests and Phillips-Perron unit root tests and at least one cointegrating vector established by the Johansen cointegration. For the lag length selection criterion, VAR at level was employed suggesting two lags by FPE, AIC, SC and HQ selection criterion.

4.4 Analysis for ARDL Bound Test Cointegration

Table 3: ARDL Bound Test Cointegration

Test Statistic	Value	Lag	Significance Level	Bound Critical Values	
				Lower Bound	Upper Bound
F-statistic	5.705295	2		I (0)	I (1)
			1%	3.74	5.06
			5%	2.86	4.01
			10%	2.45	3.5

Source: Researcher's Computation using E-views 10

The Bounds tests for the existence of cointegration were depicted in Table 4.5. Relying on these results, the computed F-statistic for the joint test of the coefficients $\beta 1$, $\beta 2$, $\beta 3$ and $\beta 4$, is 5.705295. The critical value

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bounds were 2.86 and 4.01 at the 95 percent significance level. The null hypothesis of no cointegration between the variables in the model cannot be accepted since the computed F-statistic is above the 95 percent upper bound I (1) of the critical value band computed by Pesaran et al. (2001). The rejection of the null hypothesis shows the existence of a long-run relationship among the variables in the model. The establishment of a long-run relationship among the variables in the model justifies the estimation of the long-run and short-run coefficients of the growth equation through the ARDL cointegration method.

4.5 Analysis of Short Run Relationship Between Electronic Banking and Commercial Bank Performance

From the below table, three of the variables (LATM, LMB and LPOS) in the model were statistically significant except for DLR.

Table 4: Estimated Short-Run Error Correction Model Coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LR (-1))	-0.136047	0.085788	-1.585855	0.1156
D(LATM)	0.459863	0.191448	2.402020	0.0180
D(LMB)	0.199170	0.085578	2.327357	0.0218
D(LPOS)	0.057150	0.034237	1.669263	0.0979
CointEq (-1)	-0.160531	0.038315	-4.189778	0.0001

Source: Researcher's Computation using E-views 10

The result indicates that LATM with a p-value 0.0180 and coefficient of 0.459863 has a positive and statistically significant impact on LR, that every 1% increase in the performance of ATM will lead to about 46% increase in the value of LR. Furthermore, LMB in the has a positive and statistically significant impact on LR with a p-value of 0.0218 and coefficient of 0.199170 it is evident that 1% increase in the value of POS will increases the growth of LR by about 20%. Lastly, LPOS had positive and statistically significant effect on LRs, the p-value of 0.0979 and coefficient of 0.057150 revealed that 1% rise in POS will increase LR by about 5.7%.

The coefficient of the error correction term that measures the speed of adjustment of liquidity ratio to equilibrium is -0.160531 and is statistically significant (0.0001) the negative sign confirms the system's self-correcting mechanism, aligning with theoretical expectations. This implies that an approximately 16.05% of the disequilibrium from the previous period is corrected in the current period, the liquidity ratio deviates from its long-run equilibrium by 1 unit, it adjusts by 0.1605 units in the next period to close the gap.

4.6 Analysis of Long Run Relationship Between Electronic Banking and Commercial Bank Performance

The results for the long run impact of electronic banking and bank performance on economic growth in Nigeria are reported in the table below**.**

Table 5: Estimated Long-Run Coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LATM	1.158027	0.486005	2.382746	0.0189
LMB	1.240693	0.472851	2.623858	0.0099
LPOS	0.356005	0.168085	2.118000	0.0364
C	-13.168105	2.668235	-4.935136	0.0000

Source: Researcher's Computation using E-views 10

The positive coefficient value of ATM of 1.15 is significant and that a percentage increase in ATM will definitely increase LR by 1.16%. The probability value (0.0189) below the critical value of 5% significant level. The finding established the likelihood to influence profitability of banks (LR). Perhaps, this is attributed to the service charges associated with the use of ATM in Nigeria.

Mobile banking (MB) indicates positive coefficient value with LR. Impliedly, a percentage increase in MB could positively affect LR by 1.24%. This is statistically significant with the p-value (0.0099) less than critical probability value of 5% significant level. In addition, this finding established that an increase usage of mobile banking in financial transaction will boost economic activities thereby increasing the profits made by the banks.

Point of Sales (POS) machine indicate positive coefficient value of 0.356005 and that a percentage increase in POS transactions will increase LR by 36%. This is proven by p-value (0.0364) less than critical probability value of 5% significant level. This means that increased usage of POS in Nigeria positively influences the bank performance (LR).

4.7 Analysis of the Causal Relationship Between Electronic Banking and Commercial Bank Performance

Table 6: Pairwise Granger Causality Tests

Null Hypothesis:	F-Statistic	Prob.
LATM does not Granger Cause LR	1.31596	0.0273
LR does not Granger Cause LATM	1.62399	0.2017
LMB does not Granger Cause LR	3.52652	0.0327
LR does not Granger Cause LMB	6.18491	0.0028
LPOS does not Granger Cause LR	0.33050	0.7193
LR does not Granger Cause LPOS	6.58264	0.0020

Source: Researcher's Computation using E-views 10

From table 5 above the proxies for electronic banking and commercial bank performance were used to analyses their causal relationship using the pairwise Granger causality test. However, it was established that a unidirectional causal relationship exists (ATM causes LR) and (LR cause LPOS), in addition, a bidirectional causality exists between LMB and LR.

This can be further explained as base on the value of transactions on automated teller machines contains statistically significant information that improves forecast of bank performance, so also the bank performance has a statistical information that improves the use of e-banking.

4.8 Residual Diagnostics Tests

4.8.1 Breuch Godfrey (LM) and (ARCH) Heteroskedasticity Test

The study examines the consistency of coefficients of the estimates based on Breuch Godfrey (LM) test, ARCH Heteroskedasticity test and stability test using recursive residuals. The null hypothesis for the respective diagnostic tests stated that the residuals had no serial correlation and is homoscedastic

Table 7: Residual Diagnostics Test

Test	T-Statistics	P-Value	Null Hypothesis	Conclusion
Serial correlation	0.6051	0.5478	Ho: No serial correlation	Cannot reject Ho
Heteroskedasticity	0.0063	0.9367	Ho: Homoskedasticity	Cannot reject Ho

Source: Researcher's Computation using E-views 10

The Breuch Godfrey Lagrange Multiplier (LM) test was utilized to test for serial correlation. However, autocorrelation was not confirmed in the disturbance of the error term as a result of the probability value of

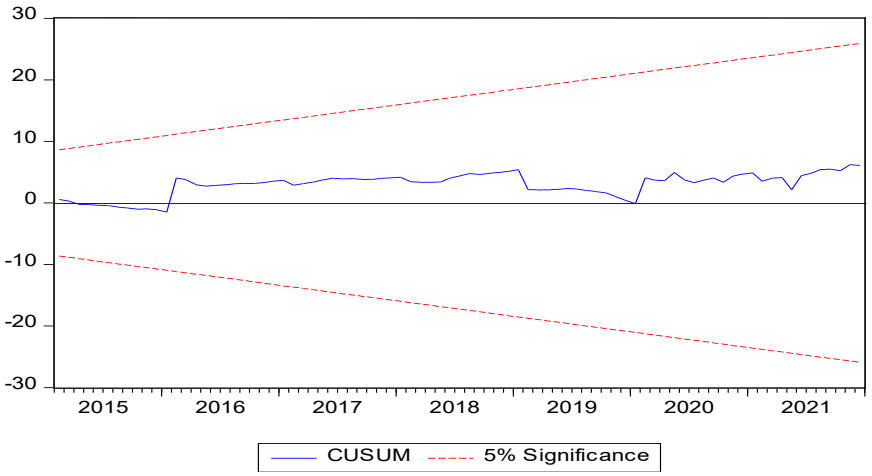
0.5478 in the growth equation. Hence, we conclude that there is no serial correlation. Therefore, the result of the diagnostic test indicates that the coefficients of the estimated model are not associated with the problems of serial correlation.

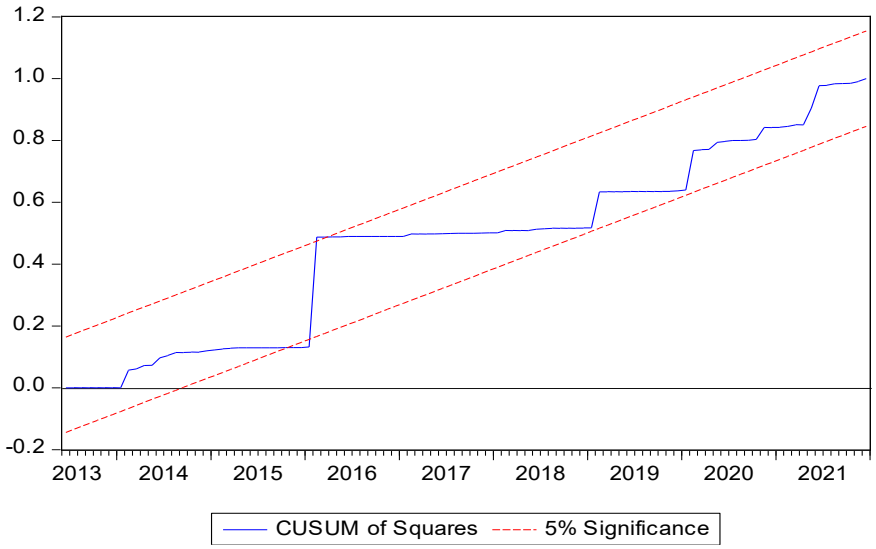
In the Heteroskedasticity test (ARCH) a probability value of 0.9367 revealed that the errors were homoscedastic and independent of the explanatory variables. Hence, we conclude that there is no heteroskedasticity. Therefore, the result of the diagnostic test indicates that the coefficients of the estimated model is not associated with the problems of heteroskedasticity.

4.8.2 Stability Diagnostics Test Results

The CUSUM and CUSUM of squares test is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum and cumulative sum of squares together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines.

Figure 2 CUSUM and CUSUM of Square of Recursive Residual





5. Conclusion and Recommendation

The study examined impact of the e-banking on bank performance of commercial banks in Nigeria by constructing an econometric model to study the impact of various factors such as automated teller machine (ATM), point of sale (POS) and mobile banking (MB). Accordingly, the impact of e-banking on commercial bank performance in Nigeria were carefully analysed using the ARDL technique. Based on the findings of the study, it is concluded that e-banking positively influences commercial banks bank performance in Nigeria. The adoption of e-banking by commercial banks has a high potential of improving bank performance and hence better returns to the shareholders. However, with the emergence FinTech's it is recommended that commercial banks must accelerate digital transformation by investing in advance technologies such as blockchains improving mobile banking and strengthening cybersecurity. To maintain growth, Nigerian banks must embrace agility, collaboration and customer-centre solutions to counter FinTech competition effectively. Failure to adapt risk losing market relevance in an increasingly digital financial landscape.

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