ELECTRONIC BANKING AND ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

This research investigates electronic banking and economic growth in Nigeria using data from the Central Bank of Nigeria (CBN) statistical bulletin spanning from 1990 - 2021. The methodology employed include: ADF test for unit root, ARDL Bound Test for Co-integration, ARDL, and diagnostic tests like, Normality test, Stability test, Granger causality test, and hypothesis testing. The unit root test result shows that the variables are in a mixed order of stationarity, three of the variables are stationary at a level while two is stationary at first difference. ARDL Bound Test for Co-integration shows that there is no long-run relationship between the variables in the model. The short-run result, ARDL results indicated that Automated Teller Machine (ATM), Point of Sale (POS), and Mobile Banking (MOB) exerted a positive and insignificant impact on gross domestic investment (GDI) in Nigeria during the period under investigation. The policy implication of this result is that an increase in Automated Teller Machine (ATM), Point of Sale (POS), and Internet Banking or Internet Banking (WEB) can fuel gross domestic investment (GDI) in Nigeria both in the short run. Also, Mobile Banking (MOB), exerted a negative relationship with gross domestic investment (GDI), implying that an increase in Mobile Banking (MOB), is capable of reducing gross domestic investment (GDI) both in the short run. From the Granger Causality test, it was also observed that ATM and POS have uni-directional causation with GDI, while WEB and MOB have a bi-directional causation with GDI. The test of the hypothesis shows that Automated Teller Machine (ATM), Point of Sale (POS), Mobile Banking (MOB), and Web Banking (WEB) exerted an insignificant impact on Gross Domestic Investment in Nigeria in the short run. Enhanced internet banking services are recommended, hence, there is a need to improve financial literacy and access to electronic banking services.

Keywords*: Electronic banking, economic growth, Nigeria.*

Introduction

Electronic banking is a highly information-intensive activity that heavily depends on information technology (IT) to acquire and deliver information to all pertinent users. Globalization, competition, and the rapid development of information technology systems all contributed to the birth of e-banking. It has evolved into a self-service delivery channel, allowing banks to provide information and services to their clients more conveniently through various technology services such as the internet and mobile phone. The use of electronic banking and bank service delivery has grown in popularity in Nigeria over the last decade (Ada & Ugbabe, 2015), owing to the

increasing accessibility and innovation of internet services and mobile banking in the country (Obazee & Omalusi, 2016). As a result, electronic banking and bank service delivery have become critical tools for financial inclusion in Nigeria (Adewale & Oludayo, 2018).

However, it is still unclear how these services will affect the Nigerian economy (Ugbabe, 2013). This has made it necessary to conduct additional study on the impacts of electronic banking and the provision of bank services in Nigeria. Examining the effects of electronic banking and bank service delivery on the Nigerian economy is the study's main goal, with an emphasis on how well these services perform in terms of customer satisfaction and service delivery. Despite the advantages of mobile banking, online transactions, and electronic banking in Nigeria, there are still a number of concerns regarding the country's present economic situation and the availability of instruments to guarantee economic growth and stability (Odedokun, 2018). However, its execution and effects on the economy need to be assessed. At this instance, Effiong and Ekpenyong (2017) noted that very little research had been conducted in this regard to examine the viability of mobile banking to the Nigerians economic growth. The government's cashless policy on banking may be a better payment system that tackles the difficulties and disadvantages of using money as an exchange medium (Douda, 2018).

Additionally, the motivations behind the implementation of the cashless policy in Nigeria, such as the country's ambition to rank among the largest economies by 2020, as well as the potential advantages of the strategy, such as a decrease in crime rates, a reduction in the risk of carrying large sums of cash, a decrease in political corruption, a decrease in banking costs, an improvement in monetary policy for managing inflation, and general economic growth and development of Nigeria (Ogueke and Abinbele, 2018). Despite the fact that electronic banking is fast gaining acceptance in Nigeria, it is pertinent to state that its impact on the growth of the Nigerian economy, is not enormous. The Nigeria economy is still backward in terms of growth and development; perhaps the ugly situation is because the monetary policy is not yet effective.

Operational Hypothesis

The following hypotheses are formulated to guide the study:

$H_0$1: Mobile banking has no significant impact on Gross Domestic Investment in Nigerian.

$H_0$2: Web banking or internet banking has no significant impact on Gross Domestic Investment in Nigeria.

$H_0$3: Automated Teller Machine (ATM) has no impact on Gross Domestic Investment in Nigeria.

$H_0$4: Point of Sales (POS) does not have effect on Gross Domestic Investment in Nigeria.

2.1 Conceptual Framework

Electronic banking (e-banking) is a self-service delivery channel that enables banks to provide information and services to their clients more conveniently through various technology services such as the internet and mobile phone (Belbergui, Elkamoun, & Hilal, 2021a,b). The advancement and development of e-banking has increased competitiveness in the market for financial goods and services. Such technology is being implemented by an increasing number of banks and other financial organizations in order to improve service quality and customer satisfaction (Kartiwi, Rfieda, & Gunawan, 2013). Electronic banking has long been recognized as playing an important role in economic development due to its ability to generate liquidity in the economy by facilitating financial intermediation between savers and borrowers. Electronic banking is a cutting-edge service delivery method that provides a wide range of financial services such as cash withdrawal, funds transfer, cash deposits, payment of utility and credit card expenses, cheque book requests, and other financial needs, (Onyedimekwu & Oruan, 2013).

For many years, accountants, bankers, technology specialists, entrepreneurs, and other practitioners have advocated for the elimination of physical cash and the implementation of more flexible, efficient, and cost-effective retail payment solutions in accordance with global trends (Fansa, 2007). Numerous conferences and seminars have been held to discuss the ideas of a cashless and chequeless society as advocated by the Bank for International Settlements. (2005). Many researchers have been interested in bankers' views of the benefits of electronic banking, particularly in recent years.

2.1.1 Types of Electronic Banking

Electronic banking consists of the following: mobile banking, internet banking, telephone banking, electronic card etc.

Automated Teller Machine (ATM): This is a type of electronic banking device that enables customers to conduct basic banking operations without the assistance of a bank teller. Customers can use ATMs to take cash, check their account balance, transfer funds between accounts, and, in some cases, deposit cash or checks. Customers can use a debit or credit card to access ATMs, and they must usually enter a personal identification number (PIN) to conduct transactions securely. ATMs can be found in a variety of locations, including bank branches, retail malls, airports, and other public areas.

Mobile Banking is a sort of electronic banking in which customers can conduct financial transactions using a mobile device such as a smartphone or tablet. Downloading a mobile banking app offered by a bank enables customers to access their accounts and perform various banking functions such as checking account balances, transferring funds between accounts, paying bills, and depositing checks remotely. Additional features of mobile banking apps may include sending alerts and notifications for account activity, finding nearby ATMs, and managing credit or debit card settings. Customers benefit from the convenience and accessibility of mobile banking, which allows them to conduct banking transactions whenever and wherever they have an internet link.

Internet Banking, also referred to as online banking, is a form of electronic banking that enables customers to perform banking transactions over the internet via a bank's website or mobile application. Through internet banking, customers can perform various tasks like viewing account balances, transferring funds between accounts, paying bills, and accessing other banking services. This method of banking is highly convenient as it enables customers to perform banking activities from anywhere with an internet connection. Moreover, internet banking provides real-time account information and allows customers to monitor their account activity, thus making it easier for them to manage their finances.

Point of Sale (POS) terminal is an electronic device that retailers use to process payments from customers using credit or debit cards. POS terminals are often connected to a merchant's bank account or payment processor and enable the transfer of funds from the customer's account to the merchant's account. Typically, the customer swipes or inserts their card into the terminal and

enters their personal identification number (PIN) or signs for the transaction. The POS terminal verifies the transaction and authorizes the transfer of funds from the customer's account to the merchant's account. Some POS terminals also support contactless payments using near-field communication (NFC) technology or mobile payments via smart phones or mobile wallets. The use of POS terminals is widespread and convenient, as it allows merchants to process payments quickly and securely, while providing customers with a variety of payment options.

Electronic Funds Transfer (EFT) is a system that enables electronic transfer of funds from one bank account to another without the need for physical cash or checks. EFT transactions can be initiated by individuals or organizations, and they can involve either credit transfers (where money is transferred from one account to another) or debit transfers (where money is debited from one account and credited to another). EFT transactions are processed and settled electronically through secure networks, making them faster and more efficient than traditional payment methods. They also reduce the risk of errors, fraud, and theft associated with paper-based transactions. EFT is widely used for both personal and business transactions and is an important component of modern electronic banking.

2.1.2 Electronic Banking Services in Nigeria

Banking has come a long way since the days of ledger cards and other manual filing systems. Most banks now have electronic systems to handle their daily volumes of information retrieval, storage, and processing, regardless of whether they are automated or not. Electronic banking appeal as well as its product development is rapidly growing and the global acceptance has strongly encouraged its penetration. The success of e-banking is contingent upon reliable and adequate data communication infrastructure. Therefore, it is efficient for banks to invest in online transactions through the creation of networks. However, there has been a mix-up between electronic banking and internet banking. The fact is that internet banking is subsumed in electronic banking

The history of electronic banking in Nigeria can be traced back to the Babangida Administration's 1986 Structural Adjustment Programme (SAP). The SAP effectively ended the type of banking services provided by the first wave of banks, dubbed "Arm Chair Banking". SAP altered not only the structure but also the substance of banking operations. The volume of

banking activities increased dramatically as the number of banks increased from 40 in 1986 to 120 in 2003 (Adewuyi, 2013). In the 1990s the Central Bank of Nigeria (CBN) issued guidelines for the introduction of electronic banking in the country. The next major milestone in the history of electronic banking in Nigeria was the introduction of the ATM in the early 2000s. This was followed by the introduction of internet banking in the mid-2000s, which allowed customers to perform banking transactions online. The first electronic payment system in Nigeria was the NIBSS Electronic Funds Transfer (NEFT), which was introduced by the Nigeria Interbank Settlement System (NIBSS) in 2004 (CBN, 2003).

The introduction of mobile banking in Nigeria in the late 2000s marked a significant development in the history of electronic banking in the country. Mobile banking has since become a popular method of banking in Nigeria, with many banks offering mobile banking apps that allow customers to perform transactions using their mobile phones. The adoption of the cashless policy in Nigeria in 2012 also played a significant role in the growth of electronic banking in the country. The policy aimed to reduce the amount of cash in circulation and encourage the use of electronic payment systems such as POS (Point of Sale) machines, mobile payments, and internet banking, as well as curb crime link with finance such as banditry, money laundry, embezzlement of public funds, etc. (CBN, 2012)

Today, electronic banking has become an integral part of the Nigerian banking system, with many banks and unconventional banking platform offering a wide range of electronic banking services to customers.

2.2 Theoretical Framework

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was introduced by Fred Davis in 1986 and is a commonly used model for studying consumer behavior when it comes to adopting a new technology. According to the model, two variables influence whether a computer system is accepted by its potential users: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which a person thinks that using the system will improve their work performance, whereas perceived ease of use refers to the amount of mental or physical effort required to use the technology. In the context of electronic banking, perceived usefulness refers to how much consumers believe electronic banking services can help them with their

financial activities, whereas perceived ease of use refers to the perceived simplicity and convenience of using electronic banking.

2.2.2 Financial Intermediation Theory

Financial intermediation theory explains the role of financial intermediaries in the economy. Financial intermediaries are institutions that channel funds from savers to borrowers. The theory explains why financial intermediaries exist, the credit allocation and other services they provide in spot and forward credit markets, the contractual relationships between intermediaries and borrowers, and the risks they face (Bhattacharya & Thakor, 1993). Banks also provide other services, such as payment processing and risk management, to help savers and borrowers transfer money. The rise of electronic banking has altered the position of financial intermediaries. Customers who use electronic banking can access banking services via electronic channels such as the internet and mobile devices rather than visiting a real bank branch. This has fundamentally altered the character and delivery of banking services.

Electronic banking has the potential to reduce the cost of financial intermediation by eliminating the need for physical branches, lowering transaction costs, and improving operational efficiency. Consequently, this can result in decreased borrowing costs for borrowers, increased access to credit, and higher economic growth. Faster and more efficient financial transactions can be achieved through electronic banking, resulting in reduced transfer time of funds from savers to borrowers. By doing so, financial intermediation efficiency can be increased, leading to improved access to credit and higher investment, ultimately driving economic growth.

Real-time access to customer data and transaction history provided by electronic banking can enhance banks' risk management capabilities. This can enable accurate assessment of credit risk, leading to reduced instances of default and promoting financial stability. Such stability can increase investor confidence and promote investment, ultimately supporting economic growth.

The use of electronic banking can foster innovation in the financial industry by providing a platform for developing novel financial products and services. As a result, competition in the financial industry can increase, leading to reduced costs and improved access to credit, ultimately fueling investment and economic growth.

Thus, electronic banking can promote economic growth by increasing the efficiency of financial intermediation, reducing borrowing costs, enhancing risk management, and promoting innovation in the financial industry. These benefits can be realized through policies that encourage the adoption and usage of electronic banking while ensuring the safety and soundness of the financial system.

2.2.3 Neoclassical Growth Theory

Neoclassical growth theory suggests that economic growth is driven by technological progress, capital accumulation, and efficient allocation of resources. The simplest and most popular version of the Neoclassical Growth Model is the Solow-Swan Growth Model. The model explains that economic growth results from capital accumulation through household savings, which continues until the stage of unconditional convergence as diminishing marginal returns to capital set in [Solow, (1956), Swan, (1956)]. The emergence of electronic banking can be seen as a technological innovation that has the potential to increase capital accumulation, promote efficient allocation of resources, and stimulate economic growth.

The idea is further explained by the following concepts:

1. Capital accumulation: By providing a platform for the mobilization and allocation of savings, electronic banking can boost capital accumulation. Savings that are allocated efficiently can lead to increased investment in productive assets, which can stimulate economic development.
2. Efficient resource allocation: Electronic banking can support efficient resource allocation by facilitating credit access for borrowers with productive investment possibilities. This can result in optimal resource allocation and support economic growth.
3. Technological advancement: Electronic banking can be viewed as a technological advancement that can support technological advancement in the financial industry. This can contribute to increased efficiency and productivity, which can lead to economic growth.
4. International trade: By providing a platform for the transfer of funds across boundaries, electronic banking can help to ease international trade. This has the potential to boost economic development by encouraging international trade and investment. These benefits

can be realized through policies that encourage the adoption and usage of electronic banking while ensuring the safety and soundness of the financial system.

2.3 Empirical Issues

Electronic banking has many advantages, dangers, innovations, and conveniences, according to Krishnamurthy and Wills (2006). ATMs, telephones, and internet banking aided banks in successfully delivering products. In his paper, Krishnamurthy also discussed the operational efficiency of e-banking, which included fundamental, simple, and advanced transactional e-banking. Customers could choose from a variety of offerings at each site. The researcher also addressed some risks, such as the loss of customer confidentiality, financial instability, the possibility of fraud, the emergence of legal claims, and so on. As a result, the researcher advised banks to pursue a strategy in which risks and innovation in banking products advance in tandem.

Paul (2006) highlighted the importance of technology and the extent of remote channels in the banking sector, as well as their implications, strengths, weaknesses, possibilities, and dangers. Paul proposed that information technology had two effects on banking. For starters, it reduced the costs associated with information management by substituting traditional methods with automated operations. Second, it had changed the way clients accessed bank products and services. The author discovered that the use of RTGS, NDS, and CFMS improved payment system safety, security, efficiency, and soundness.

Finally, the author demonstrated that technology had a substantial impact on the banking industry's structure in the form of bank branches, bank personnel, and alliances.

Raghvan (2006) emphasized the effects of information technology, communications, and electronic data processing on the banking sector. He also attempted to envisage India's perspective of banks in 2020, taking into account the impact of online banking, ATMs, and EFT on bank performance, as well as initiatives taken in liberalization, privatization, and globalization. He also looked at the future of internet and online banking. Because of the proven benefits of automating manual operations, online and internet banking was expected to grow exponentially. He also investigated the fact that an estimated 46 lakh net users were online at the time, with that figure expected to rise to 160 lakh by March 2008. In addition, he researched the expected indicators of Indian banks.

Krishnamurthy & Wills (2006) pointed out the benefits, risks, innovations and convenience involved in e-banking. ATMs, telephones, and online banking aided banks in effectively delivering products. In his article, Krishnamurthy also discussed the operational efficiency of e-banking, which covered basic, simple, and advanced transactional e-banking. Customers could choose from a variety of services at each venue. The study also mentioned various hazards, such as the loss of consumer confidentiality, financial instability, the possibility of fraud, the emergence of legal claims, and so on. As a result, the researcher advised banks to pursue a strategy in which risks and innovation in banking products move in tandem. According to Agha, Ukommi, Ekpenyong and Effiong, (2020), the technological innovations and industrial development of a given society is predicated upon the quality of technical education it acquires.

Aduda and Kingoo (2012), used many ATMs and several debit cards issued to test electronic banking in their study in Kenya, and ROA was used to quantify performance; data for the study was received from the Central Bank of Kenya. To test hypotheses, descriptive and inferential statistics were used. Electronic banking and bank performance were discovered to have a favorable and significant association. Okoro and Kigho (2013) discovered a substantial association between e-transaction and economic growth when investigating the issues and potential of e-transaction in Nigeria. They noted that because e-commerce was still in its infancy at the time of their study, it required the trust and support of the government, corporate entities, and individuals to be a successful innovation in the country. Akande (2016) indicates that technological advancement is crucial for business success, and business owners should embrace computer-aided systems (CAS) for efficiency and effectiveness. Similarly, Ismail (2007) found that IT positively contributes to business performance. Eveka-Nwokeji (2012) emphasizes the need for small and medium-scale enterprises (SMEs) to adopt IT in their business processes, highlights the importance of technological advancement and IT adoption for business success, and recommends that SMEs embrace computer-aided systems to improve efficiency and effectiveness.

Isibor *et al.* (2018) investigate the effect of electronic banking technology on customer satisfaction and economic growth in Nigeria in their paper "Impact of Electronic Banking Technology on Customers' Satisfaction and Economic Growth in Nigeria." While other researchers have studied the effect of e-banking on bank performance, profit, and e-banking challenges, the authors note that their study is unique in that it examines the impact on both

customers and economic development. The paper analyzes data from 384 respondents using a pair sample t-test and finds that electronic banking technology has a significant positive effect on customer satisfaction and economic development in Nigeria. According to the authors, banks should continue to engage in electronic banking technology in order to increase customer satisfaction and retention.

Method

3.1 The Design

The study adopted the *ex-post facto* research design. This is because the researcher does not aim to control any of the variables under investigation. Another justification for the research design is the desire of the researcher to use secondary data to test the hypothesis formulated. Thus, the study will examine already existing data that spans a period of 2009 – 2022.

3.2 Data Sources

Data used in this study were gathered together from the reports and bulletin of Central Bank of Nigeria (CBN) for the period of 2009 – 2021.

3.3 Model Specification

The model to specify the functional relationship is given as follows:

$GDI = f(MOB, WEB, ATM, POS)$ ……. (1)

When equation (1) is expressed in a linear equation form with error term incorporated into it, it becomes:

$GDI = \beta_0 + \beta_1 MOB + \beta_2 WEB + \beta_3 ATM + \beta_4 POS + \varepsilon$ ……. (2)

Expressing equation (2) in log form for easy interpretation in elasticity, we have

$\ln GDI = \beta_0 + \beta_1 \ln MOB + \beta_2 \ln WEB + \beta_3 \ln ATM + \beta_4 \ln POS + \varepsilon$ ……... (3)

Where:

GDI = Gross Domestic Investment

MOB = Mobile Banking

WEB = Internet Banking or Internet Banking

ATM = Automated Teller Machine

POS = Point of Sell

β_0 = Intercept or constant term

$\beta_1 - \beta_4$ = Parameters to be estimated. They measure the effect of the independent variables on the dependent variables.

ln = Natural logarithm

ε = Stochastic or error term. This takes care of other variables not accounted for in the model.

3.4 Method of Analysis

Regression analysis was used examining the impact of electronic banking on the banking sector and the Nigerian economy.

3.4.1 Economic APriori Expectation

Based on the variables provided, we can make some economic apriori expectations about the potential relationships between them:

3.5.2 First Order Test

The statistical criteria used to test the first-order hypothesis include:

R^2 test, Student T-test, F-test, Probability test

3.5.3 Second Order Test (Econometric Criterion)

The tests carried out under this criterion are:

Unit Root Test: The purpose of the Unit Root Test is to check if time series data is stationary to avoid obtaining incorrect regression results. To check for stationarity, the Augmented Dickey-Fuller Unit Root Test was employed.

Augmented Dickey-Fuller Test: The augmented Dickey-Fuller test was utilized due to possible non-normality and non-identical distribution of errors, and biased residual variance.

Co-integration: The Engle-Granger test was adopted to determine whether the variables are integrated in the same order. This method enabled the researcher to determine the number of co-integrating vectors among variables in consideration. After testing the unit root, the null

hypothesis of no co-integration is rejected when the p-value is greater than 0.05 at a 5% level of significance.

Normality Tests: The Jarque-Bera normality test was carried out to ascertain the normality of residuals in the model using the histogram-normality test.

Granger Causality Test: The Granger Causality Test was used to verify the usefulness of one variable to forecast the other.

Coefficient of Multiple Determination and Durbin Watson (DW) Statistics Tests: The coefficient of determination (R2) and Durbin-Watson were used in the interpretation of the results. The coefficient is used to measure the individual contribution of the variables to variation in the dependent variable. Durbin Watson (DW) Statistics tests for autocorrelation in the regression.

Results and Discussion

The table 1 shows the median, maximum, and maximum standard deviation, skewness, kurtosis, and Jaque-Bera test for the normality of the Model variables. The mean values simply tell us the average value of each of the variables. The descriptive statistics result above presents the mean of Gross Domestic Investment (GDI), Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking or Internet Banking (WEB), and Mobile Banking (MOB)as 28.81542, 2071.069, 1112.138, 2189.172, and 2337.504 respectively. The media values tell the middle value of each of the variables. The Median variable taken from the highest to the lowest value is Point of Sale (POS) (0.000000).

Internet Banking (WEB) takes the maximum value of 54503.97, while Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking or Internet Banking (WEB), and Mobile Banking (MOB)have the minimum mean value of 0.000000from the given observation. The standard deviation shows that the degree of variability of the gross domestic investment is lower than its mean. This implies that the series is more spread out. While the standard deviation of Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking or Internet Banking (WEB), and Mobile Banking (MOB) is greater than their various mean, implying that the series is less spread out.

The skewness results below show that Gross Domestic Investment (GDI), Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking or Internet Banking (WEB), and Mobile Banking (MOB) are positively skewed. This implies that the distribution has a long right tail and mean and median values are greater than the mode for each variable. The Kurtosis of Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking or Internet Banking (WEB), and Mobile Banking (MOB) is greater than 3 which implies that the distribution is assumed to be peaked (leptokurtic) relative to normal while gross domestic investment is less than 3 (platykurtic), suggesting that its distributions is flat relative to a normal distribution. The Jarque−Bera statistics show that the series is normally distributed since the p-values of all the series are not statistically significant at the 5% level. Thus, informing the acceptance of the null hypothesis that says each variable is normally distributed.

Table 1: Summary Descriptive Statistics

	GDI	ATM	POS	WEB	MOB
Mean	28.81542	2071.069	1112.138	2189.172	2337.504
Median	27.53981	0.000000	0.000000	0.000000	0.000000
Maximum	53.18669	21230.93	24455.42	54503.97	51798.96
Minimum	14.90391	0.000000	0.000000	0.000000	0.000000
Std. Dev.	11.06996	4174.825	4336.125	9845.298	9352.690
Skewness	0.385654	3.240866	5.105465	4.959087	4.885312
Kurtosis	2.096697	14.96396	27.97404	26.61032	26.10823
Jarque-Bera	1.881161	246.8655	970.6212	874.4232	839.2736
Probability	0.390401	0.000000	0.000000	0.000000	0.000000
Sum	922.0935	66274.20	35588.43	70053.52	74800.12
Sum Sq. Dev.	3798.863	5.40E+08	5.83E+08	3.00E+09	2.71E+09
Observations	32	32	32	32	32

Source: **Authors computation (2023) from EViews 10 output**

Test for Stationarity

The Augmented Dickey-Fuller (ADF) unit root test was performed to ascertain the order of integration. The results of the stationarity test are presented in Table 2.

Table 2: Stationarity Test Results

Variables	Order of Integration	Critical Values			ADF Statistics	Prob.
		1%	5%	10%		
Δ (GDI)		-3.670170	-2.963972**	-2.621007	-3.475171	0.0159
Δ (ATM)	I (0)	-3.737853	-2.991878**	-2.635542	6.910947	1.0000
Δ (POS)	I (0)	-3.737853	-2.991878**	-2.635542	13.98606	1.0000
Δ (WEB)	I (1)	-3.679322	-2.967767**	-2.622989	16.19219	1.0000
Δ (MOB)	I (0)	-3.724070	-2.986225**	-2.632604	35.28556	0.9999

Source: Author's computation (2023)using EViews 10

Note: *The ADF test was performed using the Schwarz information criterion and the automatic lag selection set as 2 lags.*

Note: **, **, and *** imply statistical significance at 1%, 5%, and 10% levels respectively.*

Note:

- Δ= Difference operator
- I(d) = Numbers of times of integration.
- Levels= 10%, 5%, 1% levels of significance

The table 2 reveals that all the series are stationary; hence has no unit root. Model estimation relating to time series data that are not stationary is sure to produce unreliable regression results. Gross Domestic Investment (GDI) and Internet Banking (WEB) were stationary at first difference I(0) at a 5%significance level, while Point of Sales (POS), Automated Teller Machine (ATM), and Mobile Banking (MOB) was stationary at the level at 5% significance level. As can be seen, the ADF statistic is greater than the critical values for each of the variables tested. The unit root test result shows that the order of integration of the variables comprises a mixture of 1(0) and 1(1), as such the most appropriate model to be adopted in analyzing data remains Auto-Regressive Distributed Lag (ARDL) Model and the appropriate co-integration method to be adopted is ARDL Bound test for co-integration method.

The ARDL bound test statistic for co-integration reduces to an ADF unit root test of the residuals of the co-integration regression. If the residuals contain a unit root, then there is no co-integration. After running our co-integration test, we obtain the following results.

Table 3a: ARDL BOUND Test for Co-Integration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Sig.	I(0)	I(1)
F-statistic	1.490956	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Authors computation (2023)

From the result above, the F statistic which is 1.490956at absolute value is less than the critical values at 1%, 5%, and 10% levels of significance for both the lower bound and upper bound. This, therefore, means that there is no co-integration (long-run relationship) between the variables. As such we will only focus on analyzing the short-run estimates.

Table 3b: Short-run ARDL Results

ARDL Error Correction Regression
Dependent Variable: D(GDI)
Sample: 1990 2021
Included observations: 30

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ATM)	0.002540	0.002505	1.014007	0.3257
D(ATM(-1))	-0.003515	0.002411	-1.457924	0.1642
D(POS)	0.004440	0.009589	0.463062	0.6496
D(POS(-1))	-0.044269	0.029969	-1.477169	0.1590
D(WEB)	0.008562	0.005573	1.536176	0.1440
D(WEB(-1))	0.067322	0.035408	1.901330	0.0754
D(MOB)	-0.002873	0.008371	-0.343258	0.7359
D(MOB(-1))	0.042701	0.020004	2.134616	0.0486

R-squared	0.957079	Mean dependent var	27.35004
Adjusted R-squared	0.922206	S.D. dependent var	9.749808
S.E. of regression	2.719378	Akaike info criterion	5.143408
Sum squared resid	118.3203	Schwarz criterion	5.797300
Log-likelihood	-63.15112	Hannan-Quinn criter.	5.352594
F-statistic	27.44450	Durbin-Watson stat	2.094101
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Author's computation (2023).

The R-squared as well as the Adjusted R-squared of 0.95 and 0.92 showed that the explanatory variables accounted for more than 95% and 92% variations in the explained variable. The p-value of the F- Statistics is less than 5% (i.e., 0.000000< 0.05). This implies that the F statistics is significant, therefore the null hypothesis is rejected, and it is concluded that the explanatory variables are jointly significant in influencing the dependent variable gross domestic investment. The Durbin-Watson statistic of 2.094101 indicates the existence of no

autocorrelation as the ARDL model revealed 2.094101 which fell within the acceptance range in applied research of no autocorrelation.

From Table 3b, the estimates of the current value of Automated Teller Machine D(ATM)is not statistically significant and display a positive relationship with gross domestic investment (GDI) in the short-run under the evaluation period. Nevertheless, the one-year lag value of automated teller machine D(ATM (-1)) maintained an insignificant relationship at all significance levels but displayed a negative relationship with gross domestic investment.

The current value of point of sales D(POS) exhibited positive insignificant influence on gross domestic investment. The positive sign is in line with the apriori expectation. Nevertheless, the one-year lag value of point of sales D(POS (-1)) maintained a negative insignificant relationship with gross domestic investment (GDI).

The estimates of the current value of internet banking D(WEB) is not statistically significant and display a positive relationship with gross domestic investment (GDI)in the short run under the evaluation period. The positive sign is consistent with the apriori sign. Nevertheless, the one-year lag value of Internet banking D(WEB(-1)) maintained statistical significance at 10% significance level but displayed a positive relationship with gross domestic investment (GDI). This sign is in line with the apriori expectation.

Lastly, the estimates of the current value of Mobile Banking D(MOB) is not statistically significant at 5 percent and display a negative relationship with gross domestic investment (GDI) in the short-run under the evaluation period. The negative sign is not consistent with the apriori expectation. Nevertheless, the one-year lag value of Mobile Banking D(MOB(-1)) maintained statistical significance at 5% significance level but displayed a positive relationship with gross domestic investment (GDI). This sign is not in line with the apriori expectation.

Table 4a: Error Correction Result

ECM Regression

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	-0.061007	0.017804	-3.426555	0.0035
R-squared	0.574998	Mean dependent var		-0.485701
Adjusted R-squared	0.413093	S.D. dependent var		3.098383
S.E. of regression	2.373668	Akaike info criterion		4.810075
Sum squared resid	118.3203	Schwarz criterion		5.230434
Log likelihood	-63.15112	Hannan-Quinn criter.		4.944551
Durbin-Watson stat	2.094101			

* p-value incompatible with t-Bounds distribution.

Source: Author's computation (2023).

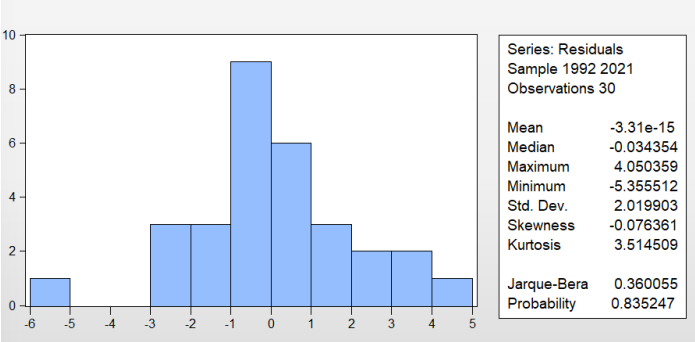
ECM: The sign of the short-run dynamic interactions is consistent with that of the long-run relationship. The estimated error correction coefficient of -0.061007 (0.0035) is significant, has the correct sign, and implies a very low speed of adjustment to equilibrium after a shock. Over 6% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

Diagnostic Tests

Normality Test

The models are examined for normal distribution. The Jarque-Bera (JB) statistics is used to test for the normality of the models. The null hypothesis is that the models are normally distributed. The decision rule is to reject the null hypothesis if the p-value is less than a 0.05 level of significance.

Figure 5a: Normality test of the models of the study



Source: Author's computation (2023).

In the figure 5a above, the Jaque-Bera statistics are used to test for the normality of the model. The Jaque-Bera p-value of 0.835247 is greater than 0.05, thus, there is a normal distribution. That is, the study, therefore, accepts the null hypothesis that the model is normally distributed.

Stability Test

To determine the stability of the model, CUSUM and CUSUM of squares were used. The estimated model is stable if its recursive residuals lie within the two critical bounds. On the other hand, if residuals fall outside the two critical lines the model is said to be unstable. The results of the stability test are presented in Figures 2a and 2b. The analysis in Figure 2a and 2b indicate that both the graph of CUSUM was stable because the recursive residuals fall within the critical line, meaning that they are all within the 5 % critical bounds. This result implies that the estimated parameters for the study are stable for the period under investigation.

Figure 5b1: Plot of Cumulative Sum of Recursive Residuals

CUSUM RESULT

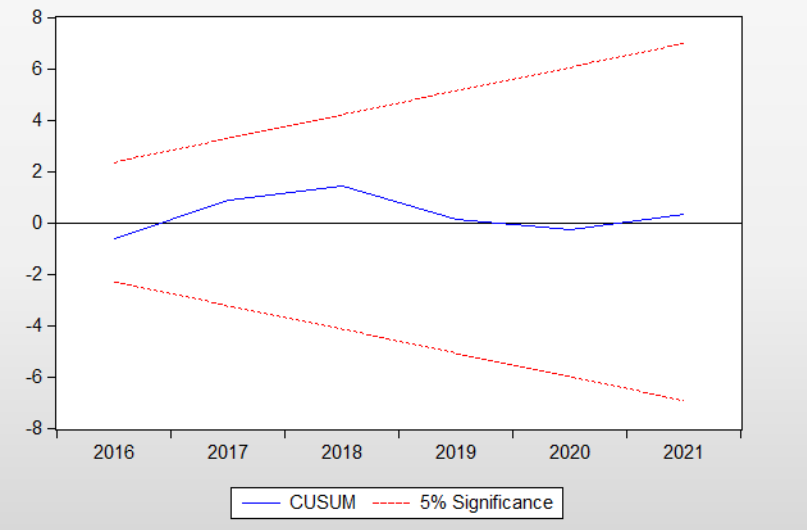


Figure 5b2: CUSUM of squares test

CUSUM OF SQUARES

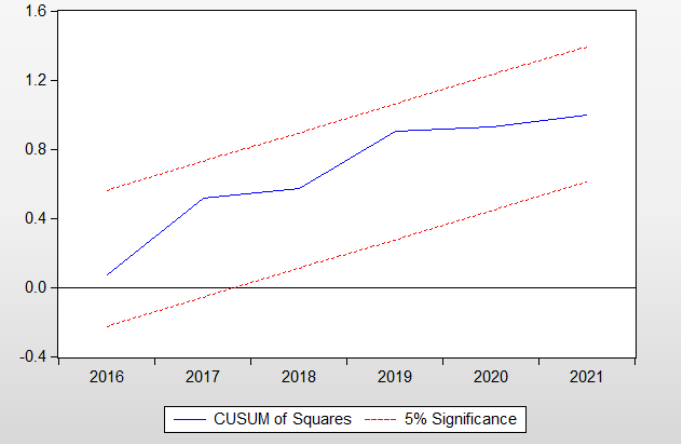


Figure 4.2b: CUSUM of squares test

Granger Causality

Co-integration between two variables does not specify the direction of a causal relation, if any, between the variables. Economic theory guarantees that there is always

Granger Causality in at least one direction Order, D. and L. Fisher, (1993). Before the granger causality test, we assume that the variables are stationary, and the residuals are uncorrelated. To examine the hypothesis of the granger causality test, the probability values of the F-statistics are appointed. We accept the null hypothesis if the P-value is greater than 5% otherwise reject Ho. Hence, this aspect of the work seeks to verify the direction of Granger Causality between RGDP and NOEXP. Estimation results for granger causality between the very variables are presented below:

Table 6: Granger Causality Test Result

Pairwise Granger Causality Tests
Sample: 1990 2021

Null Hypothesis:	Obs	F-Statistic	Prob.
ATM does not Granger Cause GDI	30	6.29833	0.0061
GDI does not Granger Cause ATM		0.60731	0.5527
POS does not Granger Cause GDI	30	5.69618	0.0092
GDI does not Granger Cause POS		1.02928	0.3719
WEB does not Granger Cause GDI	30	3.71879	0.0386
GDI does not Granger Cause WEB		4.73837	0.0180
MOB does not Granger Cause GDI	30	7.23064	0.0033
GDI does not Granger Cause MOB		2.60902	0.0935
POS does not Granger Cause ATM	30	195.145	6.E-16
ATM does not Granger Cause POS		6.66476	0.0048
WEB does not Granger Cause ATM	30	323.551	1.E-18
ATM does not Granger Cause WEB		45.7883	4.E-09
MOB does not Granger Cause ATM	30	44.1702	6.E-09
ATM does not Granger Cause MOB		19.1167	9.E-06
WEB does not Granger Cause POS	30	717.213	8.E-23
POS does not Granger Cause WEB		62.5056	2.E-10
	30	192.536	7.E-16

MOB does not Granger Cause POS			
POS does not Granger Cause MOB		125.724	9.E-14
MOB does not Granger Cause WEB	30	49.1623	2.E-09
WEB does not Granger Cause MOB		941.901	3.E-24

Source: Author's computation (2023).

From the table above, it was also observed that ATM and POS have a uni-directional causation with GDI, while WEB and MOB has a bi- directional causation GDI.

Conclusion and Recommendations

The Study examined the impact of electronic banking on the banking sector and the Nigerian economy. The explanatory variables are Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking or Internet Banking (WEB), and Mobile Banking (MOB) in Nigeria between the periods of 1990 through 2021 while the dependent variable is the Gross Domestic Investment (GDI). The study adopted an ex-post facto research design and used secondary data obtained from the CBN Statistical Bulletin. The study covered a period of 31 years (1990 to 2021). The data were subjected to the Augmented Dicker Fuller stationarity test to determine the best suitable econometric tool for analyses. The Autoregressive Distributive Lag (ARDL) was used for the model estimation.

This paper examined the impact of electronic banking on the Nigerian economy for the period 1990-2021. The results from short-run ARDL indicated that Automated Teller Machine (ATM), Point of Sale (POS), and Mobile Banking (MOB) exerted a positive and insignificant impact on gross domestic investment (GDI) in Nigeria during the period under investigation. The policy implication of this result is that an increase in Automated Teller Machine (ATM), Point of Sale (POS), andInternet Banking or Internet Banking (WEB) can fuel gross domestic investment (GDI) in Nigeria both in the short run. Also, Mobile Banking (MOB), exerted a negative relationship with gross domestic investment (GDI), implying that an increase in Mobile Banking (MOB), is capable of reducing gross domestic investment (GDI) both in the short -run. From theGranger Causality test, it was also observed that ATM and POS have a uni-directional causation with GDI, while WEB and MOB has a bi- directional causation GDI.The test of the hypothesis shows that Automated Teller Machine (ATM), Point of Sale (POS), and Mobile

Banking (MOB), web banking (WEB) exerted an insignificant on Gross Domestic Investment in Nigeria in the short run.

The study's findings yield several noteworthy recommendations of significance to policymakers, financial institutions, and investors:

Firstly, the research underscores the positive and significant short-term impact of Automated Teller Machines (ATM) and Point of Sale (POS) on gross domestic investment (GDI) in Nigeria. It is therefore advisable for policymakers and financial institutions to maintain their efforts in promoting the utilization of these electronic banking services. Encouraging both businesses and individuals to embrace ATM and POS services holds the potential to stimulate investment within the country.

Secondly, the study reveals a negative relationship between Mobile Banking (MOB) and GDI in the short term, signaling that an increase in Mobile Banking could potentially reduce GDI. Consequently, policymakers are urged to exercise caution in the expansion of mobile banking services, necessitating further research to comprehend the underlying reasons for this adverse correlation and formulate strategies to mitigate its adverse effects.

Thirdly, Web Banking (WEB) was found to exert an insignificant immediate influence on GDI in Nigeria, though it highlights a bi-directional causation between WEB and GDI. Policymakers and financial institutions should direct their efforts toward enhancing and promoting internet banking services. This involves bolstering the security and user-friendliness of online banking platforms to incentivize their adoption by both businesses and individuals.

Fourthly, as electronic banking services continue to evolve, there is a pressing need to intensify initiatives aimed at improving financial literacy among the population and expanding access to these services. This entails proactive measures to enhance financial inclusion and bridge the digital divide, ensuring a broader segment of the populace can reap the benefits of electronic banking.

Lastly, considering the research outcomes, it is advisable for investors and businesses to adopt a diversified approach in their investment portfolios and strategies. Relying solely on a single electronic banking service may not be the most prudent course of action. Diversifying investments across various sectors and asset classes can serve as a prudent risk mitigation strategy against potential fluctuations associated with electronic banking services. These

recommendations collectively provide a comprehensive framework for enhancing the role of electronic banking in fostering investment and economic growth in Nigeria.

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APPENDIX

DATA PRESENTATION

YEAR	GDI (% of GDP)	ATM	POS	WEB	MOB
1990	53.1866852	0	0	0	0
1991	48.40571698	0	0	0	0
1992	43.77938896	0	0	0	0
1993	44.48885975	0	0	0	0
1994	42.08362086	0	0	0	0
1995	37.23966698	0	0	0	0
1996	36.62555769	0	0	0	0
1997	38.47745854	0	0	0	0
1998	40.6149508	0	0	0	0
1999	38.34181136	0	0	0	0
2000	34.10954141	0	0	0	0
2001	30.92588983	0	0	0	0
2002	27.58250942	0	0	0	0
2003	29.38679832	0	0	0	0
2004	27.11796542	0	0	0	0
2005	26.18958967	0	0	0	0
2006	27.86558554	0	0	0	0
2007	21.24460887	0	0	0	0
2008	19.8969961	0	0	0	0
2009	22.04953582	548.6	11.03	84.15	1.27
2010	17.562103	399.71	12.72	25.05	6.65
2011	16.3605621	1,561.74	31.02	59.61	18.98
2012	14.95882591	1,984.66	48.01	31.57	31.51
2013	14.90390593	2,828.94	161.02	47.32	142.8

2014	15.80270277	3,679.88	312.07	74.04	346.47
2015	15.49010409	3,970.25	448.51	91.58	442.35
2016	15.36673615	4,988.13	759	132.36	756.9
2017	15.47432765	6,437.59	1,409.81	184.6	1,102.00
2018	19.8137748	6,480.09	2,383.11	675.92	1,974.25
2019	25.41589099	6,512.61	3,204.75	478.14	5,080.96
2020	27.49711671	5,651.07	2,351.96	13,665.21	13,097.02
2021	33.83469467	21,230.93	24,455.42	54,503.97	51,798.96

Source: Central Bank of Nigeria Statistical Bulletin, 2021.