

Does the Use of Technology Enhance Bank Performance

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Abstract— This study examined if does the use of technology enhance bank performance in Nigeria 2005 to 2020. Data for the study were sourced from Central Bank of Nigeria (CBN) statistical bulletin 2021 edition and Nigeria deposit insurance corporation (NDIC). Auto regression distribution lag (ARDL) model was employed to analyze the data. Findings revealed that Automated Teller Machine (ATM) has insignificant relationship with Return on assets and Liquidity ratio, Mobile banking (MOB) has insignificant effect on Return on assets and Liquidity ratio and Point of sales (POS) has insignificant effect on Return on assets and Liquidity ratio. The study concluded that electronic banking has insignificant effect on bank performance when tested individually but jointly they (ATM, POS and MOB) all significantly affect bank performance. The researcher therefore recommended that regulatory authorities should look into high cost of transacting via electronic system so as to encourage users.

Index Terms— Automated Teller Machine, Auto regression distribution lag (ARDL).

I. INTRODUCTION

Banking operations in recent times has transformed from the time of manual ledger and other manual filling system to electronic system. Banks today has electronic system to handle their voluminous task which increases their performance.

Performance in this context is taken by the market and the investing banking public to mean profit and output. Managements of banks are keen in ensuring that their banks do not fail in the aspect of enhancing their performance which reflect in their annual declaration of profit. It is therefore topical to examine empirically the contribution of electronic banking instruments in facilitating the performance of deposit money banks in Nigeria.

Electronic Banking being the process by which bank customers initiates banking transactions via electronic device without necessarily visiting the banking hall has replaced traditional way of rendering banking services in this contemporary time. Report of Technical Committee on E-Banking (CBN, 2003), defined e-banking as a means whereby banking business is transacted using automated processes and electronic devices such as personal computers, telephones, facsimiles, internet, card payments and other electronic channels. James (2012) opined that the internet is perhaps one of the most useful tools in contemporary world economies. Its use has touched virtually every aspect of human endeavour especially banking. Technological breakthroughs and product designs have led to the emergence of e-banking services which in recent time has become

globally popular. The future of all businesses particularly those in the service industry rely hugely on information technology. Babatunde and Salawudeen (2017) opines that Nigerian banks have no doubt invested much on technology; and have widely adopted electronic and telecommunication networks for delivering a wide range of value added products and services.

Information technology is more than computers, it encompasses the data a business creates and uses as well as a wide spectrum of increasing convergent and linked technologies that processes such data. Information technology for banks takes different forms which include: computerization of customers' accounts and information storage and retrieval, deposit and withdrawal through Automated Teller Machine and networking to facilitate access to accounts from any branch of the bank. The use of internet and websites to bundle a host of services that go beyond transactional financial services which is increasing among banks. According to Offei and Nuamah-Gyambah (2016), customers are now seeking for a faster and convenient technology with more rewarding banking experience. Surendran (2012), opined that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are two factors mentioned in Davis's Technology Acceptance Model (TAM) that influences users' decision to use a particular technology system. Users will eventually lose interest in e-banking if they feel that it is no longer useful even if the system is somewhat easy to handle (Obiri-Yeboah, Kyere-Djan, Kwarteng, 2013). Therefore banks that fail to respond to the emergence of e-banking in the market are likely to lose their customers.

Apochi (2017) identifies several benefits accruing from the use of electronic channel. Some of the benefits identified in his work include convenience, reduced risk of cash related crimes, more service options, cheaper access to out of branch banking services, access to credit and ease of using account anywhere in the world. Babatunde and Salawudeen (2017) stated that financial institutions operate under an unpleasant business environment and are exposed to deep internet challenges such as security, quality of service, epileptic power supply, dominance of cash transaction in the economy, low level of awareness among Nigerians. Agwu and Carter (2014), opined that despite the high cost of transactions and epileptic network connections associated with e-banking system in Nigeria, the introduction of e-banking into banking operations has brought an increase in the volume of deposits, as well as fraudulent practices. Many rich individuals and corporate entities do not patronize e-banking because of the high level of risk associated to it. Even with the aim of using it to decongest banking halls, these halls are most of the time still full with customers.

According to Oluwatolani, Joshua and Philip (2011), the evolution of electronic banking in Nigeria can be traced to

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1986 when the banking sector was deregulated. The result of this deregulation brought far reaching transformation through computerization and improved bank service delivery. Competition with new products became keen within the system while customer sophistication posed a challenge for them, hence the reengineering of processing techniques of business accounts encourage the automation of financial services especially among new generation of commercial and merchant banks.

The 21st century has witnessed a dramatic evolution in the financial service industry as a result of the rapid advancement in technological transformation which has become known as e-developments. These changes have engulfed all areas of financial intermediation and financial markets such as e-finance, e-money, electronic banking (e-banking), e-brokering, e-insurance, e-exchange and e-supervision. This new information technology (IT) is turning into the most important factor in the future development of banking, influencing bank's marketing and business strategies. As a result of rapid advances in IT and intensive competition in the banking sector, the adoption of e-banking is being increasingly used as a channel of distribution for financial services (Mahdi & Mehrdad, 2010 cited in Fonchamnyo, 2013). Taiwo, J.N and Agwu, M.E. (2017) observed that banks' operational efficiency in Nigeria since the adoption of electronic banking has improved compared to the era of traditional banking.

The Central Bank of Nigeria has introduced huge changes in the financial sector over time in order to facilitate easy production and trade of products and services. The use of e-card, internet banking facilitates the ease and convenience in handling transactions. E-banking customers have possibility to access online or electronic banking for 24 hours which allows them to view historical banking transactions, transfer money between accounts, make savings, perform other operations anywhere. Moreover increase in knowledge and ability to manage internet banking, online transactions and ATMs have resulted in more independent bank customers. This means banking is entirely relying on monetary transactions that use electronic means rather than cash

The world has witnessed an upsurge of electronic payment instruments meant to facilitate trade and simplify payments, before the introduction of electronic payment into Nigerian banking system; customers had to walk into the banking hall to do transactions of all kind. They had to queue up and spend more hours to talk to a teller to make their transactions. Inconveniences caused by these long queues discourage most customers who sometimes renegade from the queues in annoyance. For many years, bankers, IT experts, entrepreneurs and others have advocated for the replacement of physical cash and the introduction of more flexible, efficient and cost effective retail payment solutions (Siyabola, 2013). According to Gonzalez (2008), Electronic banking has experienced explosive growth and has transformed traditional practices in banking. Saidi (2018) opines that deposit money banks offer several kinds of electronic payment platforms to address customer payment needs. Of all these platforms, the grossly used platforms consist of the Automatic Teller Machine (ATM), Point of Sale (POS), Mobile Banking (MOB) and the internet services (Web).

This study is an attempt to critically examine and analyze the effects of Electronic Banking and performance of deposit

money banks in Nigeria with reference to, Mobile Banking (MOB), Point of Sales (POS), Automated Teller Machine, Return on Assets (ROA) and liquidity ratio (LQR).

1.2 Statement of the Problem

Existing literature posits that electronic commerce gives competitive advantage for banks by reducing operational cost and provides best satisfaction of customer needs. Burnham (1996) recounted that in the world of electronic commerce, it is very important that banks should provide electronic banking services in order to survive. Hence, most banks in developed and some in developing parts of the world are currently offering electronic banking services with different levels of complexity. In today's banking, banks that do not offer electronic banking services may lose their customers to their competitors (Orr, 1999). Banks must incorporate information and communication technology in their day to day operation in order to excel.

The introduction of electronic banking system which was supposed to bring about efficiency and effectiveness in service delivery, reduce queues and cash handling seems to have rather resulted to disappointment to customers. Most customers complain of time wasted in automated teller machine point of most banks due to poor connectivity between central server and the branches. Poor knowledge of the use and operations of the electronic payment platforms is considered by many as a major cause for non-usage of the e-products. High illiteracy among the Nigerian population has also affected the successful implementation and operation of electronic banking in Nigeria (Okon and Amaegberi 2018). Besides, the adoption of electronic banking has been associated with major challenges to the banking industry in terms of risk exposure. The volume of deposits has increased as well as fraudulent practices experienced by Nigerian banks since its adoption in the economy (Chibueze, Maxwell and Osondu, 2013).

It is arguable that electronic banking contributes to bank performance as revealed in the conflicting views of most researchers (Agboola, 2001). Thus, some previous studies revealed that the effect of e-banking on bank performance can either be positive or negative. For instance, Oyewole (2013) examined electronic banking and bank performance in Nigeria and discovered that e-banking services increases bank profit. However, Malhotra (2009) in his work on the impact of internet banking on bank performance discovered that electronic banking indicators have no significant impact on bank performance. In same vein, Noor (2011) revealed an insignificant relationship between electronic banking and bank performance. These inconsistencies in findings created the gap for this study. Furthermore this study utilized data up to 2018 which is not the case with most existing studies.

1.3 Objective of the Study

The main objective of this study is to investigate if the use of technology enhance bank performance

The specific objectives are to:

1. investigate the relationship between mobile banking and return on assets.
2. appraise the relationship between mobile banking and liquidity ratio
3. evaluate the relationship between Automated Teller Machine (ATM) and return on assets.

4. examined the relationship between Automated Teller Machine (ATM) and liquidity ratio
5. determine the relationship between point of sales and return on assets.
6. evaluate the relationship between point of sales and liquidity ratio.

- H₀₁: Mobile banking has no significant relationship on return on assets.
- H₀₂: Mobile banking has no significant relationship on liquidity ratio.
- H₀₃: There is no significant relationship between Automated Teller Machine and return on assets.
- H₀₄: Automated Teller Machine does not significantly relate to liquidity ratio.
- H₀₅: Point of sales has no significant relationship on return on assets.
- H₀₆: There is no significant relationship between point of sales and liquidity ratio.

1.4 Research Questions

This study is guided by the following research questions:

1. What is the relationship between mobile banking and return on assets?
2. To what extent does mobile banking relate with liquidity ratio?
3. What is the relationship between Automated Teller Machine (ATM) and return on assets?
4. To what extent does Automated Teller Machine (ATM) relate with liquidity ratio?
5. What is the relationship between point of sales and return on assets?
6. What is the relationship between point of sales and liquidity ratio?

1.6 Scope of the Study

This study examined electronic banking and performance of deposit money banks in Nigeria from 2005-2020, that is for a period of 17 years. This frame of coverage is based on E-banking operations carried out in Nigeria which includes the use of ATM, POS, MOB and how it affect bank performance (return on assets and liquidity ratio). The choice of this scope is based on when secondary data for selected variable are made available.

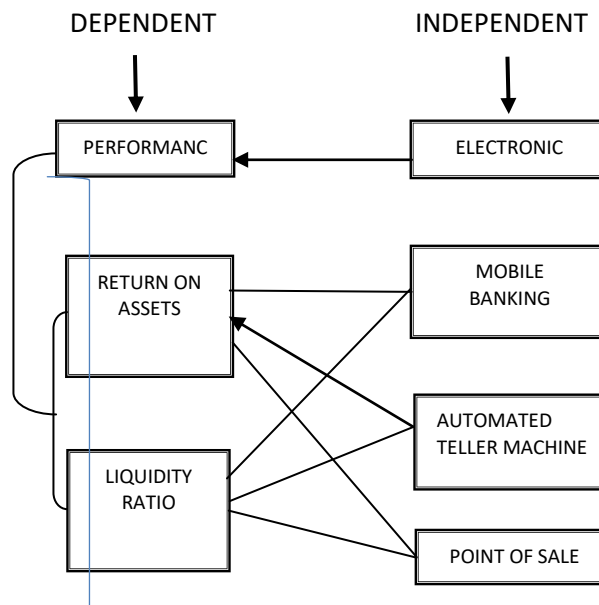
1.5 Research Hypotheses

The following hypothesis is stated in line with research objectives and questions as follows:

II. REVIEW OF RELATED LITERATURE

2.1 Conceptual review

OPERATIONAL FRAMEWORK



2.1.1 The Concept of Electronic Banking

Auta (2010) is of the view that Different authors have defined Electronic Banking in different ways based on their understanding of its application. E-banking is the term used for new age banking system and it is also called online banking .E-banking uses the internet as the delivery channel by which to conduct banking activities, for example, transferring funds, paying bills, viewing checking and savings account balances, paying mortgages and purchasing financial instruments and certificates of deposits (Mohammed, Siba&Sreekmar, 2009 cited in Auta, 2010). Electronic banking is the delivery of banking services and products through the use of electronic means irrespective of place, time and distance. Such products and services can include deposit-taking, lending, account management, the

provision of financial advice, electronic bill payment, and the provision of other electronic payment products and services such as electronic money (Dogarawa, 2005). Electronic banking is also known as the automated delivery of new and traditional banking products and services directly to customers through electronic, interactive communication channels (Daniel, 1999; Sathye, 1999). Cashless economy does not mean an absence of cash transactions in the economic settings but one in which the amount of cash-related transactions are kept to the lowest minimum (Apochi, 2017). As has been pointed out by (Akinyele&Olorunleke, 2010), electronic banking means the provision of information about the bank and its product via a page on the internet. Izogo, Nnaemeka, Ezema and Onuoha (2012) citing Idowu (2011)

assert that electronic banking is a means where by banking business is transacted using automated processes and electronic devices such as personal computers, telephones, fax machines, internet, card payments and other electronic channels.

2.1.2 Electronic Banking Services

Information and Communication Technology (ICT) has made the whole world a global village and removed the time and geographical barriers. With the use of electronic network, billions of naira can move across borders by the click of a computer key and this created tremendous impact on the economy. Bank can provide e-banking services by using electronic network.

Intense competition has forced banks to rethink the way they operated their business. They have to make them more beneficial and cost effective technology in the form of electronic banking practices at lower cost. More and more people using electronic banking products and services and because a larger section of banks future customer base will be made up of computer literate customers, the banks must be able to offer these customers products and services that allow them to do their banking by electronic means. If they fail to do this they will simply not survive.

The following are some service coming under electronic banking;

Electronic Data Interchange (EDI) is a technique use to communicate business, financial and transaction information between computer systems of different organizations and their business partners. In banks, financial EDI, is mostly used to settle bills and also enable customers to view and download account details.

2.1.2.1 Automated Teller Machine (ATM)

The ATM is a device that allows customers who have ATM card to perform routine banking transaction without interacting with the human teller. The ATM was one of the earliest electronic banking products, being introduced in the mid 1970s. It provided customers with the ability to withdraw or deposit funds, check account balances, transfer funds and check statement information. As is the case with any technology, it took some time before customers became familiar with the ATM and came to accept it as an alternative way of doing their banking.

2.1.2.2 Point Of Sales (POS)

Point of sale is a portable device that allows businesses to accept bank card payments for transactions. The POS system was introduced by the central bank of Nigeria in 2012 as part of its plan to enforce the cashless policy in financial transactions across the country. This is the point at which a customer makes payment to the merchant in exchange for goods or after provision for service.

2.1.2.3 Telephone Banking

This is the most familiar of the tele-banking devices and it allows customers to transact banking business over the phone. It can be used as an alternative to the traditional branch banking or in conjunction with it (Stan, 1997 cited in Agboola, 2001). The customer can access their accounts using telephone lines as a link to the financial institutions computer centre. Services rendered here include account balance, transfer, change of pin etc. This product has also experienced low patronage due to inadequate awareness and education of the customer on how to maximally use their

phone to transact simple banking operations (Siyabola, 2013).

2.1.2.4 Mobile Banking

This involves the use of mobile phone for settlement of financial transactions. This is more or less fund transfer process between customers with immediate availability of funds for the beneficiary. It uses card infrastructure for movement of payment instructions as well as secure SMS messaging for confirmation of receipts to the beneficiary. It is very popular and exciting to the customers given low infrastructure requirements and a rapidly increasing mobile phone penetration in the country. Services covered by this product include account enquiry; funds transfer; recharge phones; changing passwords, bill payments. Even though the product is exciting most customers are yet to fully buy into it in Nigeria, hence, both the apex bank and other banks still have a lot to do in terms of increasing awareness of the product to the saving populace in the country (Siyabola, 2013).

2.1.2.5 Personal computer banking

Personal computer banking or PC banking is also a fast growing area in electronic banking. Pc banking lets customer's access information on their account through a dial up connection with their bank. Customers can perform basically all the transactions that are available with telephone banking. They also have the ability in some cases to download information and process it in their own financial management software.

2.1.2.6 Plastic and currency

Plastic card or plastic currency is used on electronic device for financial exchanges online between buyers and sellers in form of digital financial instrument such as credit card number and debit card number backed by a bank or intermediary. Recently, several innovations helped to simplify customer payment, which includes credit card, debit card, ATM cards and smart cards.

2.1.2.7 SWIFT

The Society for Worldwide Inter-bank Financial Telecommunication (SWIFT) provides reliable, secure and expeditions telecommunication facilities for exchange of financial messages all over the world.

2.1.2.8 Electronic Fund Transfer (EFT)

EFT system permits transfer of funds from any account at any branch of any member bank in any city to another account at any branch of any member bank in any other city.

2.1.2.9 NIBSS Instant Payment

NIBSS (Nigeria Inter-Bank Settlement System) Instant Payments (NIP) is an account-number based, online-real-time Inter-Bank payment solution developed in the year 2011 by NIBSS. It is the Nigerian financial industry's preferred funds transfer platform that guarantees instant value to the beneficiary. NIBSS Instant Payment can be used to transfer funds, make payments or receive funds. The NIP service commenced with only two (2) commercial banks as participants. However, today, the number of participants has grown to include all commercial banks, Micro-Finance banks (MFBs), and Mobile Money Operators (MMOs).

The technology facilitates electronic presentation of clearing items over a highly-secure wireless Virtual Private Network (VPN), the banks are able to obtain clearing reports and files

through the same VPN after every clearing session from the comfort of their offices.

2.1.3 Bank Performance Indicator

Liquidity Ratio: Liquidity is defined as the ability of a company to meet its financial obligations as they come due. A liquidity ratio is a financial ratio that indicates whether a company's current assets will be sufficient to meet the company's obligations when they become due. Liquidity ratio is a computation that is used to measure a company's ability to pay its short-term debts. There are three common calculations that fall under the category of liquidity ratios; the current ratio, the acid/quick ratio and the operating cash flow ratio. Liquidity ratios are an important class of financial metrics used to determine a debtor's ability to pay off current debt obligations without raising external capital.

$$\text{Liquidity Ratio: (i) Current Ratio} = \frac{\text{Current Assets}}{\text{Current liabilities}}$$

$$\text{(ii) Acid test/ Quick ratio} = \frac{\text{Current assets} - \text{closing inventory}}{\text{Current liabilities}}$$

$$\text{(iii) Cash Ratio} = \frac{\text{Cash and cash equivalent}}{\text{Current liabilities}}$$

Return on assets (ROA): This is a financial ratio that shows the percentage of profit a company earns in relation to its overall resources. It is commonly defined as net income divided by total assets. Net income is derived from the income statement of the company and is the profit after taxes. The assets are read from the balance sheet and include cash and cash-equivalent items such as receivables, inventories, land, capital equipment as depreciated, and the value of intellectual property such as patents. Return on assets is a profitability ratio that provides how much profit a company is able to generate from its assets. In other words, return on assets measures how efficient a company's management is in generating earnings from their economic resources or assets on their balance sheet. ROA is shown as a percentage, and the higher the number, the more efficient a company's management is at managing its balance sheet to generate profits.

$$\text{Return on Assets (ROA)} = \frac{\text{Net profit before interest and tax}}{\text{Total Assets}} \times 100$$

2.2 Theoretical Framework

This study is anchored on the following theories

2.2.1 Technology Acceptance Model

This model is at times referred to as Technology Acceptance Theory (TAT) it addresses the adoption behaviour of customers which is usually assessed by the aim to use a specified system which is predicated on the impression of its usefulness and the convenient usability of the system. Previous authors researched on the fundamental construct of TAMs validity in forecasting the acceptance of individual's and noted that TAMs fundamental construct does not wholly

address the explicit effect of technology and the usability factors that actually influence the user's acceptance (Moon & Kim, 2001). Davis, 1989 contents that expected usefulness is usually termed as an individual belief to improve the degree job performance by the application of modern technology of information system. Perceived effortlessness of use shows how easy an individual learns the operations of the emerging technology and information system.

The model emphasizes the positive impact of perceived simplicity of use on the impression of the system's usefulness (Gefen, Karahanna, & Straub, 2003).Pikkarainen, Pikkarainen, Karjaluo to and Pahnila(2004) carried out a survey in Finland to establish the actual impact of perceived usefulness and concluded that it endeared use of inventive, autonomous, self-service and user friendly technologies provided by banks for access of financial services to the users in the twenty first century. Gerrard and Cunningham (2003) noted that the perceived usefulness rested on the services provided by the bank. These services range from paying utility bills, checking account balances, loan applications, money transfer abroad, and getting pertinent mutual funds information.

Evidence points at the importance of perceived usefulness on adoption intention. Tan and Teo (2000) posit that adaptation of innovations is significantly determined by the perceived usefulness. In conclusion, the likelihood of the adoption of e-banking is dependent on its perceived usefulness and impact in growing the coming (Potaloglu&Ekin, 2001). The major drivers of e-banking acceptance are viewed as the TAM variables which include the aspects of perceived ease of use and perceived usefulness. Thus this theory is adopted in this study since it looks at the ease of use and usefulness of e-banking.

2.3 Empirical Review

Agboola (2001) studied the impact of computer automation on the banking services in Nigeria. Multiple regression ordinary least square method was employed. The study revealed that electronic banking has tremendously improved the services of some banks to their customers in Lagos. The study was however restricted to the commercial nerve center of Nigeria and concentrated on only six banks. He made a comparative analysis between the old and new generation banks and discovered variation in the rate of adoption of the automated devices.

Aragba-Akpore (1998) investigated on the application of information technology in Nigerian banks. He employed the use of ordinary least square methods. He cited the Diamond Integrated Banking Services (DIBS) of the Diamond Bank Limited and electronic smart card accounts (ESCA) of All States Bank Limited as efforts geared towards creating sophistication in the banking sector. The study inferred that the on-line system has facilitated internet banking in Nigeria as evidenced in some of their launching websites. He found also that banks now offer customers the flexibility of operating an account in any branch irrespective of which branch the account is domiciled.

Woherem (1997) investigated on the effect on electronic banking on deposit money bank performance in Ghana. He employed the use of err correction model. The study discovered that since 1980s, Nigerian banks have performed better in their investment profile and use of ICT systems, than

the rest of the industrial sector of the economy. An analysis of the study carried out by African Development Consulting Group Ltd. (ADCG) on IT diffusion in Nigeria shows that banks have invested more on IT, have more IT personnel, more installed base for PCs, LANs, and WANs and have a better linkage to the internet than other sectors of the Nigerian economy.

Gwashi and Alkali (1996) investigated on the effect of ICT on bank performance in India 1987-1995. They employed the use of ECM. The variable captured includes; PAT, NPM, ROCE, EPS, ATM, POS. their finding revealed that ATM and POS positively affect the performance of banks in India. However, they came to a conclusion that the full effect of the use of ICT in the banking industry of India has not been fully harnessed.

Acharya, *et al.*, (2008) examined the impact of web design features of a community bank's performance using a sample of 55 community banks with online services in the five mid-western states of the USA. The author utilized both primary and secondary data by applying multiple regression models. The results show that banks with higher usability of ICT perform significantly better than those with low ICT usability.

Berger, *et al.*, (2003) examined technological progress and its effects in the banking industry using data collected from the banking industry in the United States over the period 1967 to 2001. The author employed multiple regression model, and the findings revealed that improvements in costs of lending capacity due to improvements in "back – office" technologies, as well as consumer benefits from improved "front office" technologies suggests significant overall productivity increases in terms of improved quality and variety of banking services.

Malhotra and Singh (2009) examined the implications of internet banking on the Indian banking industry using information drawn from a survey of 85 scheduled commercial banks' websites, during the period June 2007, by applying multiple linear regression model to regress ROCE, ROE and ROA on ATM, POS, MOB, NEFT. Results revealed however that profitability in the banking industry while offering internet banking has mixed findings. Some variables showed negative significant association effect while some are positive with banks overall performance.

Opera, *et al.*, (2010) investigated the impact of technology on relationship marketing orientation (RMO) and business performance (BP) of the Nigerian banks using quantitative and qualitative data generated from 123 different bank branches in Port Harcourt, with 565 targeted respondents. The authors employed multiple regression model to analyze the data, and the findings revealed that the technology exists as a moderating variable in the RMO – BP relationships of the Nigerian banks. The study also recommended that banks should be technologically compliant in order to have high performance and lasting customer relationship. England, *et al.*, examined the number of US banks offering internet banking and analysed the structure and performance characteristics of these banks. They however, found no evidence of major differences in the performance of the group of bank offering internet banking activities compared to those that do not offer such services in terms of profitability, efficiency or credit quality.

Dos Santos and Peffers (1993) empirically studied the effects of early adoption of Automated Teller Machine (ATM) technology by banks on employee efficiency using a sample of 3,838 banks covering the period 1970 to 1979 by applying multiple regression models. The finding revealed that the introduction of ATM technology improves the bank's performance.

Akram and Hamdan (2010) examined the effects of information and communication technology (ICT) on Jordanian banking industry for the period of 2003 – 2007. The authors used a sample of 15 banks to analyze the data obtained by applying multiple regression model and diagnostics test to check the normality and multi- colinearity problems. The results of the study indicated that there is a significant impact on the use of ICT in Jordanian banks on the market value added (MVA) earnings per share (EPS), Return on Assets (ROA) and Net Profit Margin (NPM).

Kagan, *et al.* (2005) examined the impact of online banking applications on community bank performance in the United States using data collected from 1183 banks operating in Iowa, Minnesota, Montana, North Dakota, and South Dakota. The authors employed an econometric model (Structural Equation Model) for the data analysis. The findings of the study revealed that online banking helps community banks improve their earning ability.

Abdullah (1985) investigated on bank automated system in Malaysia, Katagiri (1989) in Japan and Shawkey (1995) in the USA. The study employed panel analysis. The study revealed that investing in ATMs reduces banking transaction costs, the number of staff and the number of branches. Therefore, investing in ATMs increases the value of deposit accounts, which are cheaper in terms of costs of funds than other sources, such as borrowing money from other institutions, hence reducing the overall cost of funds. This suggests that there is a role for IT investment in the explanation of bank profitability.

Kozak (2005) study the values of return on asset (ROA) and over the period of 1992 – 2003. Tables and simple percentages. He found out that the value of the return on assets for the U.S, the banking sector has increased by 51 percent. This result suggests that IT improvements, associated with extensive office networks and range of offered services have helped to generate additional revenues for banks. For the same period much smaller reduction of the non-interest costs has been achieved. It means the value of cost efficiency fell by 13 percent. This means that a huge number of diverse operations require higher IT investments and additional non-interest charges. In order to assess relationships between the degree of the IT progress, and the profitability (ROA) and cost efficiency, the regression analysis was used to achieve more precise statistical results, based on quarterly values obtained from the FDIC.

Bello and Dogarawa (2005), also examined and assessed the impact of e-banking services on customer satisfaction in the Nigerian banking industry 1988-2004, the study employed the use of multiple regression, ordinary least square method. Their study found out that many banks' customers in Nigeria are fully aware of the positive developments in information technology and telecommunication which led to the introduction of new delivery channels for Nigerian commercial banks' products and services.

De Young et al (2006), investigated financial performance of internet community banks in U.S. during 1999-2001. They employed error correction model. The results found that internet adoption improved community banks' profitability, particularly through increased revenues from deposit service charges. Internet adoption was also associated with movements of deposits from checking accounts to money market deposit accounts, increased use of brokered deposits and higher average wage rate for bank employees. It found little evidence of changes in loan portfolio mix. The findings suggested that electronic adoption was associated with an economically and statistically significant improvement in bank profitability.

Mahotra and Singh (2007), examined the impact of internet banking on banks' performance and risk in India 1987-2007. The study examined a comprehensive set of 10 measures of financial performance that made it possible for the authors to critically look into bank performance. The study employed the use of multiple regression analysis. The results of the study revealed that on average, internet banks are more profitable than non-internet banks and are operating with lower cost as compared to non-internet banks, thus, representing the efficiency of the internet banks.

Njuru (2007), did a study on the challenges in implementing electronic banking strategy by commercial banks in Kenya. The objective of the study was establishing the challenges inhibiting electronic banking implementation and how banks are responding to these challenges. The targets of the study were the commercial banks in Kenya. The study employed the use of multiple regression analysis. The study found that there exist various challenges to the implementation of electronic banking in Kenya Commercial Banks. The banks have employed strategic responses to overcome these challenges with some of the responses being more popular than the rest depending on the impact they have on the implementation process. Lack of required infrastructure, resources and specialized skills commitment from the senior management team and fear of adopting the system by both the bank employees and customers were some of the major challenges that were identified while training of bank employees and customers, employing specialized technology and staff and lowering electronic banking charges were some of the popular responses that banks have been using. The entire internal and external environment however needs to be considered during the implementation of the electronic banking strategy.

Malhotra (2009), did a study on the impact of Internet Banking of Bank Performance and Risk: The Indian Experience. Particularly, it seeks to examine the impact of internet banking on banks' performance and risk. Using information drawn from the survey of 85 scheduled commercial bank's websites, during the period of June 2007. The study employed descriptive statistics and multiple regression. The results shows that nearly 57 percent of the Indian Commercial Banks are providing transactional internet banks provide. However, the multiple regression results reveal that the profitability and offering of internet banking does not have any significant association, on the other hand, internet banking has a significant and negative association with risk profile of the banks.

Oyewole et al., (2013) examined electronic payment systems and its impact on bank performance in Nigeria 1990-2012. Vector auto-regression was employed and their study found that e-payment system has a positive impact on bank

performance in terms of real ROA and ROE and that the introduction of ATMs in doing financial transaction impacts directly on economic bank performance, while other forms of e-payment channels showed a negative impact on bank performance.

Noor (2011), conducted a study on the impact of e-banking on bank profitability: evidence from Jordan. This study is aimed to test the effect of e-banking services provide by banks on the internet on the profitability of their banks during the period (2000-2009). The study sample consists of all domestic banks in Jordan separated into 3 groups. The data were analyzed using descriptive statistic and multiple regression. Ratios are used to test the effect on profitability; these ratios are Return on Assets, Return on Equity, and margin of Interest as profitability measures. Other ratio are used as Independent variables which are Market Share, Overhead Ratio, Deposits/Assets and Loan/Assets – Regression analysis is used to test the effect of e-banking services on the profit. The regression analysis showed that there is no significant effect of e-banking services on the profitability of recent adopter's banks in terms of ROA and ROE. It gives an indicator of higher expenses and cost associated with applying these services. Unlike margin, it is significantly, affected by the e-banking services. For early adopters, the result were much better than those for the early adopters, but still not significant with the profitability of these bank. Finally, internet banking is new and changing rapidly and therefore results of empirical studies on internet banking may vary considerably with different sample and methods of analysis.

2.4 Gap in literature

The focal point of this research is to investigate the effect of electronic banking on the performance of deposit money banks in Nigeria. It is arguable that electronic banking contribute to bank performance as revealed in the conflicting views of most researchers (Agboola, 2001). However, some researchers are of the view that the effect of e-banking on bank performance can either be positive or negative. Oyewole (2013) examined electronic banking and bank performance in Nigeria, discovered that e-banking services increases bank profit. However, Malhotra (2009) in his work on the impact of internet banking on bank performance discovered that electronic banking indicators have no significant impact on bank performance. In same vein Noor (2011) from the stand point of bank performance reveals an insignificant relationship between electronic banking and bank performance. Thus, the prompting of this research is to ascertain whether electronic banking significantly affect bank performance in this contemporary time. Hence, this work updates the scope to cover up to 2018 data in other to discover current effect of electronic banking on bank performance.

This study therefore seeks to theoretically and empirically investigate the relationship between electronic banking and performance of deposit money banks in Nigeria using return on assets, liquidity ratio, Automated Teller Machine (ATM), Point of Sales (POS), Mobile Banking (MOB).

III. RESEARCH METHODS

3.1 Research Design

Research design is the framework which underscores the methodology adopted by the researcher in the collection and

analysis of data. It is the blueprint of activities which a researcher has to undertake in the course of achieving the set objective of the research. Different research designs are used by different researchers depending on the objectives and general approach of the study. This study adopted the quasi-experimental research design. The quasi-experimental research design is concerned with the manipulation of an independent variable without the random assignment of participants to condition or order of condition. In this study, the data used are historical data of banks based on previous financial events of the banks. Quasi-experimental research design is also appropriate for establishing relationship between a set of dependent and independent variables. This study evaluates the effect of electronic banking and bank performance. By implication, the study seeks to establish the relationship existing between the proxies for e-banking and each of the identified proxies for bank performance. To this extent therefore, quasi ex research design is considered appropriate for this work because its explanation as stated above suits the core objective of this study as already highlighted.

3.2 Source of data

The choice of secondary data in this research study or analysis is a function of the relevance of such data to the technique applied in the research topic in particular. Hence, the data used in this study were collected from Central Banks of Nigeria (CBN) publication, 2018 edition and financial statement of deposit money banks as published in NDIC report various years.

3.3 Model Specification

The model for this study is specified thus
 In this study the ARDL model is applied to our data and the general equation is presented and explained. The lag selection necessary in order to obtain good results is described.

In this work we want to capture the long-run and short-run dynamics between deposit money banks indicators and electronic banking variables. All data is expressed as the natural logarithms form. The logarithm is taken in order to ease the interpretation of the results and to reduce possible heteroscedasticity. The applied ARDL model is given as;

This model follows proposed ARDL model by Dave Giles;

$$y_t = \beta_0 + \beta_1 y_{t-1} + \dots + \beta_p y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \dots + \alpha_q x_{t-q} + \varepsilon$$

This model was further modified as follows;

Model one

$$\Delta \ln(ROA)_t = \beta_0 + \sum_{i=1}^{p_0} v_i \Delta \ln(ROA)_{t-i} + \sum_{i=0}^{p_1} t_i \Delta \ln(MOB)_{t-i} + \sum_{i=1}^{p_2} \theta_i \Delta \ln(ATM)_{t-i} + \sum_{i=1}^{p_3} n_i \Delta POS_{t-i} + \eta_0 \ln(ROA)_{t-1} + B1 \ln(MOB)_{t-1} + B2 \ln(ATM)_{t-1} + B3 POS_{t-1} + et.1$$

Model two

$$\Delta \ln(LQR)_t = \beta_0 + \sum_{i=1}^{p_0} v_i \Delta \ln(LQR)_{t-i} + \sum_{i=0}^{p_1} t_i \Delta \ln(MOB)_{t-i} + \sum_{i=1}^{p_2} \theta_i \Delta \ln(ATM)_{t-i} + \sum_{i=1}^{p_3} n_i \Delta POS_{t-i} + \eta_0 \ln(LQR)_{t-1} + B1 \ln(MOB)_{t-1} + B2 \ln(ATM)_{t-1} + B3 POS_{t-1} + et.1$$

Where; p_j are the chosen lags, β_0 is the intercept, C_0 is the trend coefficient and ε is the white noise. The remaining coefficients describe short-run and long-run relationships.

- ROA = Return on assets
- LQR= Liquidity ratio
- MOB = Mobile banking
- ATM = Automated Teller Machine
- POS = Point of sales
- β_1 = Regression Coefficient of MOB
- β_2 = Regression Coefficient of ATM
- β_3 = Regression Coefficient of POS
- E = Error Term

The above model is looking at the impact of electronic banking on performance of deposit money banks in Nigeria using return on capital employed, earnings per shares as published by CBN and financial statement of selected deposit money banks.

3.4 Method of Data Analysis

The study made use of Auto regression lag (ARDL) model to empirically analyze the data gathered. When analyzing possible relationships between two or more variables the researcher often postulate specifications according to where Y is the dependent variable and X is a vector of independent variables and f is some function.

$$Y = f(X)$$

The ARDL model procedure introduced by Pesaran et al. (2001) is a model that tries to capture the relationship in $f(X)$. In this research the ARDL model will be clarified by describing the most simple version of ARDL i.e. a one variable $ARDL(q,p)$ model and applied to the variables of choice in this research.

Following the work by Pesaran & Shin (1998) and Pesaran et al. (2001), the $ARDL(q,p)$ model of equation can be specified by equation as where y_t is the dependent variable and x_t is the independent variable and q,p are the respective lags.

3.4.1 Test for significance

To discover whether the relationship between the dependent and the independent variable are significant, the T-test and F-test was used. In applying the F-test, the decision rule is to accept the null hypothesis if calculated F-ratio is less than the critical F-ratio at n-k-1 degree of freedom, with 95% confidence interval, otherwise it is rejected. While in the case of the t-test, if the probability value of T-calculated is greater than 5% critical value, we accept the null hypothesis inferring no relation exists among variables.

Further measures include the evaluation of how well the regression equation explains the variations observed in the dependent variable. To do this we use the coefficient of multiple determinations R^2 . R^2 here indicate the proportion of variation in Y explained by all the Independent variables.

3.5 Diagnostic Tests

The estimated equation above will be subjected to serial correlation test, normality test and specification tests using the Breusch-Godfrey Serial Correlation LM Test, the Jarque-

Bera normality test and the Ramsey Regression Specification Error test.

3.5.1 Econometric Issues and Unit Root Test

Data points are often non-stationary or have means, variances and covariance that change over time. Non-stationary behaviour can be trends, cycles, random walks or combinations of the three. The results obtained by using non-stationary time series may be spurious in that they may indicate a relationship between two variables where none exist. To avoid spurious regression results, the researcher will conduct unit root tests and generate stationary data for all the variables where applicable.

3.5.2 Units of Measurement Problems

This study includes variables that are measured in different units. This means that the units of measurement for the estimated regression coefficients will be different and therefore incomparable. Regression equation requires that the units of the term (Y) on the left side of the equation be the same as those of the total right side of the equation. You can't equate apples with oranges (Giles, 2013). To correct this, the researcher opted to use log-linear specification.

3.5.3 Test for Serial Correlation

Breusch-Godfrey test (Godfrey 1978) for serial correlation if different lags of the residuals are correlated. Mathematically the following should hold true: Covariance (ϵ_i, ϵ_j) = 0, $\forall i, j$ otherwise the series has serial correlation. Serial correlation does not affect the unbiasedness of the regression estimators but rather affect the efficiency i.e. the estimators are not BLUE (Brooks 2014). It may for example affect the standard errors of the regression which invalidate significance tests i.e. there is a possibility that wrong inferences could be made whether the independent variables are determinants of the variations in the dependent variable. The model of the residuals under the simplest form of the Breusch-Godfrey test is:

$$\epsilon_t = \epsilon_{t-1}\rho + v_t, v_t \sim N(0, \sigma_v^2)$$

The test has the following general null hypothesis and alternative hypothesis:

$$H_0: \rho = 0, \text{ No serial correlation in the model}$$

$$H_1: \rho \neq 0, \text{ There is serial correlation in the model}$$

3.5.4 Test for Heteroscedasticity

Test that all residuals have a constant variance i.e. Variance (ϵ_t) = $\sigma^2 < \infty, \forall t$. In the regular OLS estimation as well as for the ARDL model it is assumed that the residuals have a constant variance (homoscedasticity). If the model does not have a constant variance (heteroscedasticity) in the residuals the estimated coefficients will no longer be BLUE and will not have the minimum variance of the unbiased estimators. In relation to serial correlation the consequence could be that one make wrong inferences. In this thesis we will use Whites test for heteroscedasticity (White 1980) which has the following very general null and alternative hypothesis:

$$H_0: \text{ Constant variance of the residuals - Homoscedasticity}$$

$$H_1: \text{ Non-constant variance of the residuals - Heteroscedasticity.}$$

IV. DATA PRESENTATION, ANALYSIS AND INTERPRETATIONS

4.1 Data Presentation

Data presentation on return on assets (ROA), Liquidity Ratio (LQR), automated teller machine (ATM), Point of sales (POS), mobile payment (MOB). The data are presented on table 4.1 below:

4.1: Data Presentation

Table 4.1: Return on Assets (ROA), Liquidity Ratio (LQR), Automated Teller Machine (ATM), Mobile Banking (MOB), Point of Sale (POS).

YEAR	LQR (%)	ROA (%)	ATM (N'B)	POS (N'B)	MOB (N'B)
2005	50.2	1.85	502.06	85.98	6.59
2006	55.7	1.61	544.23	24.13	5.24
2007	48.8	3.89	558.76	64.55	9.36
2008	44.3	3.95	832.55	35.15	6.82
2009	30.7	3.92	548.6	11.03	1.27
2010	30.4	3.91	399.71	12.72	6.65
2011	42.0	-0.04	1,561.74	31.02	18.98
2012	49.7	2.62	1,984.66	48.01	31.51
2013	63.2	2.33	2,828.94	161.02	142.8
2014	38.3	2.29	3,679.88	312.07	346.47
2015	42.3	2.18	3,970.25	448.51	442.35
2016	46.0	1.48	4,988.13	759	756.9
2017	49.1	4.5	6,437.59	1,409.81	1,102.00
2018	60.0	4.22	6,480.09	2,383.11	260.59
2019	70.0	4.92	7,480.09	2,383.11	290.59
2020	80.2	5.85	502.06	85.98	309.89

Source: * Central Bank of Nigeria

* NDIC Annual Report and Statement of Account 2013 (Bank Returns)

* NDIC Annual Report and Statement of Account 2014 (Bank Returns)

* NDIC Annual Report 2015

* NDIC Annual Report 2016

* NDIC Annual Report 2018

The above data are in different unit of measurement; therefore, to bring the data in the same base, we calculate the logarithm for the data on each of the variables.

Table 4.2: Logarithm of LogROA ,LogLQR, LogATM, LogPOS, LogMOB for the period covering 2005 – 2018

YEA R	LogLQ R	LogRO A	LogAT M	LogPO S	LogMO B
2005	1.700487	0.267172	2.700756	1.934397	0.818885
2006	1.745855	0.206826	2.735782	1.382557	0.719331
2007	1.687975	0.589955	2.747225	1.809896	0.971276
2008	1.645951	0.596597	2.920417	1.545925	0.833784

2009	1.487138	0.593286	2.739256	1.042576	0.103804
2010	1.483231	0.592177	2.601745	1.104487	0.822822
2011	1.623249	0.04	3.193609	1.491642	1.278296
2012	1.696521	0.418301	3.297686	1.681332	1.498448
2013	1.800751	0.367356	3.451624	2.20688	1.154728
2014	1.583479	0.359835	3.565834	2.494252	1.539666
2015	1.626824	0.338456	3.598818	2.651772	1.645766
2016	1.662286	0.170262	3.697938	2.880242	1.879039
2017	1.456081	0.653213	3.808723	3.149161	1.342182
2018	1.876081	0.567813	3.808723	3.149161	1.232182
2019	1.785081	0.879213	3.808723	3.149161	1.342182
2020	1.956151	0.785312	3.811581	3.377144	2.415958

Source: Ms Excel computation from table 4.1 above

4.2 Data analysis

Table 4.3: Descriptive Analysis Table summary

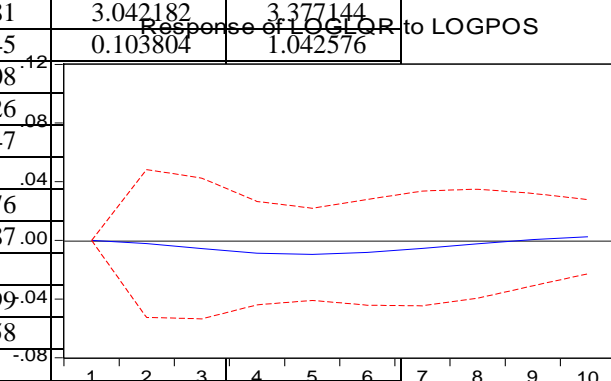
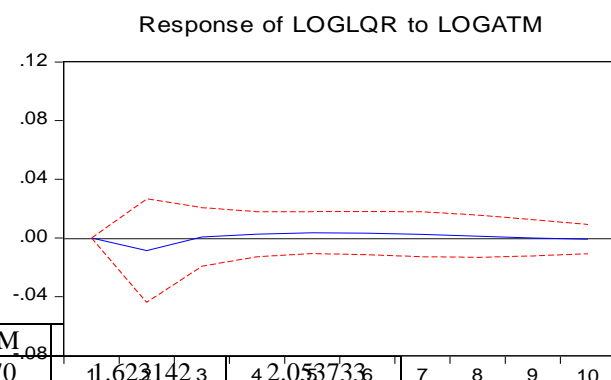
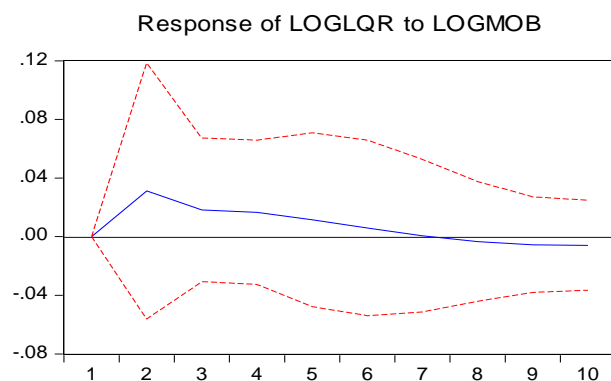
	LOGLQR	LOGROA	LOGATM	LOGPOS
Mean	1.658070	0.415624	3.205070	1.623142
Median	1.675130	0.392829	3.245647	1.388372
Maximum	1.800751	0.653213	3.811581	3.042182
Minimum	1.483231	0.040000	2.601745	0.103804
Std. Dev.	0.094237	0.197022	0.453708	0.752935
Skewness	-0.507416	-0.374959	0.013026	0.013026
Kurtosis	2.637183	1.927099	1.398047	1.398047
Jarque-Bera	0.677555	0.999537	1.497376	1.497376
Probability	0.712641	0.606671	0.472987	0.472987
Sum	23.21298	5.818743	44.87099	17.19371
Sum Sq. Dev.	0.115449	0.504628	2.676058	0.115449
Observations	17	17	17	17

The above table reveals the standard deviation of LogLQR to be 0.094237 with the mean of 1.658070, LogROA reveal a standard deviation of 0.197022 and a mean of 0.415624 ATM with the mean of 3.205070 and standard deviation of 0.453708, MOB with the mean of 1.623142 and standard deviation of 0.960086, POS with the mean of 2.053733 and standard deviation of 0.752935,

The probability value of the jaguar bera test was above 5% significant level, indicating our variable are normally distributed and the estimated result can be reliable.

4.2.1 Descriptive Analysis Graph of impulse response shock

Response to Cholesky One S.D. Innovations ± 2 S.E.

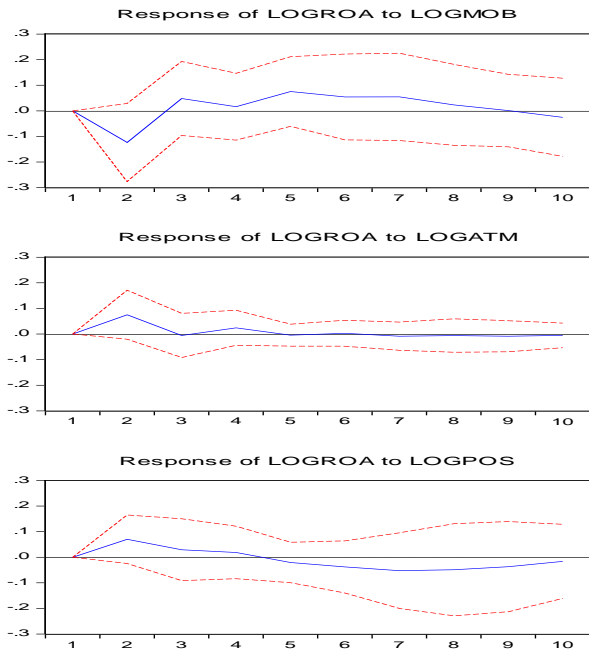


The response of MOB to one standard deviation shock with LQR reveals a positive increase from period one to period two. The trend revealed a decline between period two and three. Though this decline being positive continued till period seven where the shock lay within the imaginary line in period eight to ten the response of MOB to LQR was negative since the response curve is below the zero line.

The response of ATM to LQR negative decline between period one and two, this decrease increase slightly in period three but was still below the imaginary line. The shock between ATM and LQR revealed a positive slight increase above the imaginary from period three to period eight and then fell below the imaginary line in period 9 to 10

The response of POS to one standard deviation shock with LQR reveals a consistent decrease from period one to period eight. From period nine POS and LQR shows positive consistent rise.

Response to Cholesky One S.D. Innovations ± 2 S.E.



The response of ROA to MOB was negatively sloped in the first and second period, the third and fourth period revealed a fluctuating positive shock between ROA and MOB. Period five revealed a fluctuating positive decline till period nine. Period nine to ten experienced a negative shock between ROA and MOB.

ATM response to ROA showed a sharp positive increase shock between period one and two and fell in period three below the imaginary line and experience increase in period five. From period six there is slight negative decrease that was maintained through period ten.

The response of POS to ROA was positive in period one and two, the shock from period three was not favorable since it was below the positive line and remained consistent to the tenth period.

4.3 presentation of estimated result

Table 4.4 estimated result of model one

Dependent Variable: LOGROA

Method: ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOGROA(-1)	-0.008683	0.297067	-0.029230	0.9776
LOGATM	-0.303255	0.497145	-0.609992	0.5642
LOGATM(-1)	0.799050	0.408768	1.954778	0.0984
LOGPOS	0.461076	0.300303	1.535369	0.1756
LOGMOB	-0.266052	0.213130	-1.248310	0.2584
LOGMOB(-1)	-0.325496	0.300435	-1.083417	0.3202
C	-1.103885	1.670914	-0.660647	0.5334

From our regression result, the estimated equation model is stated as follows;

$$\text{LOGROA} = -1.103885 - 0.008683_{\text{LOGROA}(-1)} - 0.303255_{\text{LOGATM}} - 0.799050_{\text{LOGATM}(-1)} + 0.461076_{\text{LOGPOS}} - 0.266052_{\text{LOGMOB}} - 0.325496_{\text{LOGMOB}(-1)}$$

NB: kindly note that the model was adjusted by one lag in the regression process.

Table 4.5 estimated result of model two

Dependent Variable: LOGLQR

Method: ARDL

Variable	Coefficient	Std. Error	t-Statistic
LOGLQR(-1)	0.302687	0.305300	0.991443
LOGATM	0.591224	0.311468	1.898188
LOGPOS	0.184620	0.146057	1.264031
LOGPOS(-1)	0.252293	0.191271	1.319037
LOGMOB	-0.075082	0.092954	-0.807728
LOGMOB(-1)	-0.466184	0.237431	-1.963446
C	-0.780674	1.062743	-0.734584

$$\text{LOGLQR} = -0.780674 + 0.302687_{\text{LOGLQR}(-1)} + 0.591224_{\text{LOGATM}} + 0.184620_{\text{LOGPOS}} + 0.252293_{\text{LOGPOS}(-1)} - 0.075082_{\text{LOGMOB}} - 0.466184_{\text{LOGMOB}(-1)}$$

4.3.1 Test of hypotheses

The hypotheses of this study as stated in chapter one was tested using the student T-test distribution as a test for individual significant of the dependent variables at 5% significance level and joint test of significance using F-statistics

4.3.1.1 Test of hypothesis one

H₀₁: Mobile banking has no significant effect on return on assets.

The result of hypothesis one between MOB and return on assets (ROA) showed a negative relationship with a coefficient of -0.266052 and -0.325496 for lag zero and one respectively. The negative value indicate an inverse and decreasing effect on return on assets. The T- statistics and its corresponding probability value was obtained as -1.248310, 1.083417 and 0.2584, 0.3202 respectively. Since the T- stat. Prob. value (0.2584, 0.3202) is greater than 5%, the null hypothesis is accepted and the alternative rejected, thereby concluding that there is a negative and insignificant relationship between MOB and return on assets.

4.3.1.2 Test of hypothesis two

H₀₂: Mobile banking does not affect liquidity ratio to a significant extent.

H₁₂: Mobile banking affect liquidity ratio to a significant extent.

The result of hypothesis two between MOB and liquidity ratio (LQR) indicate negative relationship with a coefficient of -0.075082, -0.466184 in the zero and first lag respectively. The negative value indicate an inverse and decreasing effect on liquidity ratio. The T- statistics and its corresponding probability value was obtained as -0.807728, -1.963446 and 0.4501, 0.0972 respectively. Since the T- stat. Prob (0.4501, 0.0972) is greater than 5% the null hypothesis is accepted and the alternative rejected, thereby concluding that there is a negative and insignificant relationship between MOB and liquidity ratio (LQR).

4.3.1.3 Test of hypothesis three

H₀₃: There is no significant relationship between Automated Teller Machine and return on assets.

H₁₃: There is a significant relationship between Automated Teller Machine and return on assets.

The result of hypothesis three between ATM and return on assets indicated positive and significant relationship with a coefficient of 0.799050. The positive value indicate direct and increasing effect on return on asset. The T- statistics and its corresponding probability value was obtained as 1.954778 and 0.0984 respectively. Since the T- stat. Prob. value (0.0984) is greater than 5%, the null hypothesis is accepted and the alternative rejected, we thereby conclude that there is no significant relationship between ATM and return on assets.

4.3.1.4 Test of hypothesis Four

H₀₄: Automated Teller Machine does not significantly relate to liquidity ratio.

H₁₄: Automated Teller Machine significantly relate to liquidity ratio.

The result of hypothesis four between ATM and liquidity ratio indicated positive and significant relationship with a coefficient of 0.591224. The positive value indicate direct and increasing effect on liquidity ratio. The T- statistics and its corresponding probability value was obtained as 1.898188 and 0.1064 respectively. Since the T- stat. Prob. value (0.1064) is greater than 5%, the null hypothesis is accepted and the alternative rejected, we therefore conclude that there is no significant relationship between ATM and liquidity ratio.

4.3.1.5 Test of hypothesis Five

H₀₅: Point of sales has no significant effect on return on assets.

H₁₅: Point of sales has significant effect on return on assets.

The result of hypothesis five between POS and return on assets showed a positive relationship with a coefficient of 0.461076. The positive value indicate a direct and increasing effect on bank performance. The T- statistics and its corresponding probability value was obtained as 1.535369 and 0.1756 respectively. Since the T- stat. Prob (0.1756) is greater than 5%, the null hypothesis is accepted and the alternative rejected, thereby concluding that there is a positive and insignificant relationship between POS and return on asset.

4.3.1.6 Test of hypothesis six

H₀₆: There is no significant effect of point of sales on liquidity ratio.

H₁₆: There is a significant effect of point of sales on liquidity ratio.

The result of hypothesis six between POS and liquidity ratio (LQR) indicate positive relationship with a coefficient of 0.184620, 0.252293 in the zero and first lag respectively. The positive value indicate a direct and increasing effect on liquidity ratio. The T- statistics and its corresponding probability value was obtained as 1.264031, 1.319037 and 0.2531, 0.2353 respectively. Since the T- stat. Prob (0.2531, 0.2353) is greater than 5% the null hypothesis is accepted and the alternative rejected, thereby concluding that there is a positive and insignificant relationship between POS and liquidity ratio (LQR).

4.3.2 Coefficient of determination

The coefficient of determination also known as R² was obtained as 59% and 62% for the first and second model respectively. This result implies that about 59% and 62 percent variation is explained in the model. This implies that Automated Teller Machine (ATM), Mobile Banking (MOB), Point of Sale (POS) explained only 59% and 62% of the model which is considerably fitted.

4.4 F-Test (Joint Test)

The f-test is used to test for joint significant impact amongst variables. The result of the p-value for both models were obtained as 0.037865 and 0.008490. If the p-value is less than 5% (0.05) level of significant, we reject the null hypothesis otherwise accept it. From the result obtained P-value (0.037865 and 0.008490) < critical value (0.05) we therefore conclude that a joint significant relationship exists between electronic banking instruments and bank performance.

4.4 Diagnostic test

4.4.1 Unit root test for stationarity

Table 4.6: Unit root test with the ADF statistic-

Variable	Level of integration	T-statistic	Critical Value	Observed level P-value (5%)
logROA	I (1)	-3.760692	3.144920	0.0181
logLQR	I (1)	-3.158602	-3.144920	0.0489
logMOB	I (2)	-3.945174	-3.212696	0.0168
logPOS	I (2)	-4.772859	3.212696	0.0051
logATM	I (1)	-3.760692	-3.144920	0.0189

The table above reveal return on assets, liquidity ratio and automated teller machine were stationary at order one while mobile banking and point of sales were stationarity at second difference. This implies that the variables cannot be subjected to long run relationship with johanson cointegration test rather the ADRL test will be used to determine the existence of run relationship in the model.

4.4.2 Serial correlation test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.134136	Prob. F(6,6)	0.4412	-0.08 -0.26 2.530
Obs*R-squared	6.908541	Prob. Chi-Square(6)	. * . 0.3294 . ** .	6 9 9 50.865
Scaled explained SS	0.823477	Prob. Chi-Square(6)	0.9914	-0.10 3.007
				70.121 3 90.884
				-0.21 -0.42 4.736
Heteroskedasticity Test: Breusch-Pagan-Godfrey				. ** . . *** .
				8 1 8 20.785
				-0.06 8.555
F-statistic	0.493070	Prob. F(6,6)	. ** . 0.7947 . .	90.280 2 60.479
Obs*R-squared	4.293110	Prob. Chi-Square(6)	0.6371	9.087
Scaled explained SS	0.910836	Prob. Chi-Square(6)	. * . 0.9888 . .	100.0900.025 10.524
				-0.25 -0.21 15.16
				. ** . . ** .
				11 0 4 20.175
				-0.20 16.27
				. * . . * .
				120.076 0 40.179

The Breusch-Godfrey Heteroskedasticity Test was used to test for serial correlation in this study and the result in table above shows that there is no serial correlation in the estimated equation since the p-value of f-cal is greater than 5%.

*Probabilities may not be valid for this equation specification.

4.4.3 Autocorrelation test

Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob *
		-0.06	-0.06		
. .	. .	1	0	0.0583	0.809
		-0.29	-0.29		
. ** .	. ** .	2	2	7.15695	0.456
		-0.15	-0.22		
. * .	. ** .	3	9	0.20634	0.559
		-0.01	-0.16		
. .	. * .	4	5	2.0683	0.723
		-0.10	-0.28		
. * .	. ** .	5	0	8.23133	0.804
		-0.00			
. * .	. .	6	0.160	63.0293	0.805
		-0.01	-0.19		
. .	. * .	7	7	43.0391	0.881
		-0.11	-0.22		
. * .	. ** .	8	0	23.5145	0.898
. * .	. * .	9	0.182	0.095 5.1295	0.823
		-0.09			
. .	. * .	10	0.028	35.1818	0.879
		-0.06			
. * .	. .	11	6	0.011 5.6072	0.898
		-0.05	-0.03		
. .	. .	12	1	96.1063	0.911

The above autocorrelation result presents the Q-statistics and its probabilities are above 5%, indicates that the models are free from autocorrelation.

4.5 Discussion of findings

In this section, the empirical works of authors were discussed in relation to our findings.

The effect of MOB on ROA

The result of the first hypothesis showed negative relationship exists between mobile banking and bank return on assets. This implies that an increase in the slope of mobile banking inversely affect the performance of deposit money banks. This might be as a result of lack of understanding of the workability of devices that facilitate mobile banking operation. The findings is in line with Malhotra and Singh (2009) examined the implications of internet banking on the Indian banking industry using information drawn from a survey of 85 scheduled commercial banks' websites, during the period June 2007.

The effect of MOB on liquidity ratio

The result of the second hypothesis showed negative relationship exists between mobile banking and liquidity ratio. This implies that the use of mobile banking has indirect effect on bank liquidity. The findings is in agreement with the work of Mahotra and Singh (2007), who examined the impact of internet banking on banks' performance and risk. They concluded that a mixed finding exists between e-banking instruments and performance of deposit money banks.

The effect of ATM on ROA

The relationship between ATM and return on assets indicated positive and insignificant relationship with a coefficient of 0.799050 in the second lag. The positive value indicate direct and increasing effect on bank performance. This finding support the work of Gwashi and Alkali (1996) investigated on the effect of ICT on bank performance in India 1987-1995. They employed the use of ECM. They came to a conclusion that the full effect of the use of ICT in the banking industry has not been fully harnessed.

The effect of ATM on LQR

Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob *
		-0.31	-0.31	1.656	
. ** .	. ** .	1	9	9	60.198
		-0.10	-0.23	1.849	
. * .	. ** .	2	4	0	40.397
		-0.12	1.849		
. .	. * .	30.004	9	80.604	
		-0.14	-0.24	2.272	
. * .	. ** .	4	0	9	40.686
		-0.16	2.312		
. .	. * .	50.040	0	00.805	



The relationship between automated teller machine and liquidity ratio revealed a positive relationship with a coefficient of 0.591224. The positive value indicates a direct and increasing effect on bank performance. The implication of this result is that ATM amongst all other electronic banking variable have insignificantly impacted on bank performance. The findings also support the work of Gwashi and Alkali (1996)

The effect of POS on ROA

The relationship between Point of sales and return on assets showed a positive relationship with a coefficient of 0.461076. The positive value indicates a direct and increasing effect on bank performance. This implies that the use of POS terminals has an increasing effect on the performance of banks in Nigeria. This reflect in the low in bank transaction since most transactions were done outside the banking hall. The result is in support of ofGwashi and Alkali (1996).

The effect of POS on LQR

The result between POS and liquidity ratio showed a positive relationship with a coefficient of 0.184620 and 0.252293 in the (0,1) lag . The positive value indicate a direct and increasing effect on bank performance. The study concludes that the positive effect of POS insignificant effect bank profitability. The findings is in line with Malhotra and Singh (2009).

The response of MOB to one standard deviation shoch with LQR reveals a positive increase from period one to period two. The trend revealed a decline between period two and three. Though this decline being positive continued till period seven where the shock lay within the imaginary line in period eight to ten the reponse of MOB to LQR was negative since the reponse curve is below the zero line.

The response of ATM to LQR negative decline between period one and two, this decrease increase slightly in period three but was still below the imaginary line. The shock between ATM and LQR revealed a positive slight increase above the imaginary from period three to period eight and then fell below the imaginary line in period 9 to 10

The response of POS to one standard deviation shoch with LQR reveals a consistent decrease from period one to period eight. From period nine POS and LQR shows positive consistent rise.

The response of ROA to MOB was negatively sloped in the first and second period, the third and fourth period revealed a fluctuating positive shock between ROA and MOB. Period five revealed a fluctuating positive decline till period nine. Period nine to ten experienced a negative shock between ROA and MOB.

ATM response to ROA showed a sharp positive increase shock between period one and two and fell in period three below the imaginary line and experience increase in period five. From period six there is slight negative decrease that was maintained through period ten.

The response of POS to ROA was positive in period one and two, the shock from period three was not favorable since it was below the positive line and remained consistent to the tenth period.

V. CONCLUSION AND RECOMMENDATIONS

Summary of the entire work, conclusion, recommendations and suggestions for further research are the major contents of this chapter.

5.1 Summary

The study investigated the effect of electronic banking on performance of deposit money banks in Nigeria. E-banking variables were disaggregated into mobile banking, automated teller machine, point of sales, while return on assets and liquidity ratio were used to proxy deposit money bank performance. Quasi-experimental research design was adopted whereby secondary data on the above stated dependent and explanatory variables were sourced from the 2018 edition of the Central Bank of Nigeria (CBN) bulletin and NDIC reports of various years. The data so generated were analyzed using ARDL model, apriori test, diagnostic, statistical test. Descriptive and impulse response function was also conducted.

The diagnostic test centered on ascertaining the stability of data generated for these variables. However, the statistical test was conducted at 5% level of significance; and it covered f-test, t-test and goodness of fit test. Results of the diagnostic test showed no presence of either autocorrelation or multicollinearity.

From the analysis of data in chapter four the following findings were made;

1. The first hypothesis revealed that an insignificant relationship exists between mobile banking and return on assets
2. The study showed insignificant effect of Mobile Banking and liquidity of deposit money bank.
3. The study showed that an insignificant effect exists between ATM and ROA.
4. The study also affirms that an insignificant effect exists between ATM and LQR.
5. The study revealed that insignificant effect exists between POS and ROA.
6. The study revealed that insignificant effect exists between POS and LQR.
7. The f-test revealed a joint significant relationship between electronic banking and bank performance

5.2 Conclusion

Electronic banking from our study revealed insignificant effect on the performance of deposit money banks. E-banking has improved the banks customer relationship by rendering good services. Network failure from internet connection, fraudulent activities and the break-down of ATMs are major challenge facing customers using e-banking products. However, there was a general believe that extensive education and marketing of e-banking products from the bank could attract more customers to use the service. Electronic banking has a negative impact on the overall performance of banks. The long queues, network failure and fraudulent activities makes performance of deposit money banks less effective and efficient.

5.3 Recommendations

The following recommendation were made base on the study:

1. The bank should provide more ATM facilities; these should be placed at vantage locations within the city to reduce distance and time use to access the facility.
2. Regulatory authorities should look into the high cost of transacting, network failure and fraudulent activities which discourages potential users.
3. Banks should intensify awareness on the usage of internet banking facilities on low earn devices using USSD codes because most bank customers are still in the dark on this information.
4. The bank should conduct further research to find how to incorporate rural dwellers to efficiently utilize e-banking products.
5. The government should assist in strengthening the local network providers to attain wider coverage in their services since they are key players that facilitate e banking.

5.4 Suggestions for Further Studies/Research

There is need for further studies in the following areas;
Rural area utilization of E-banking product on profitability of deposit money banks in Nigeria.
The effect of electronic banking in combing financial exclusion in Nigeria.

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