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Electronic Banking Transactions And Intermediation Function Of Deposit Money Banks In A Developing Nation

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ABSTRACT

This study explores the influence of various electronic banking instruments Automated Teller Machines (ATMs), Internet Banking, and Point-of-Sale (POS) systems on the financial intermediation function of banks in Nigeria. The dataset were sourced from CBN statistical bulletin spanning from 2009Q to 2019Q. the study employed OLS statistical technique, the results indicate that ATM usage has a negative but non-significant effect on financial intermediation, suggesting that while ATMs are widely accessible, they may not significantly enhance banks' ability to channel funds between savers and borrowers. Conversely, Internet Banking shows a positive and significant impact, emphasizing its effectiveness in enhancing intermediation by offering convenient access to financial services and promoting broader financial engagement. However, POS systems reveal a significant negative effect on financial intermediation, implying that despite facilitating transactional convenience, their impact may detract from banks' intermediation activities at the 0.05 significance level. These findings suggest that while digital banking innovations can enhance accessibility and convenience, not all electronic instruments contribute positively to banks' core intermediation role.

Keywords: Internet banking, innovative technology, financial intermediation, electronic banking

1.0 INTRODUCTION

Generally, banks play an intermediation function of sourcing funds from surplus units and channeling such funds to the deficits units where they can be engaged in creating economic value. It is expected that the turnaround time between depositors and banks preparing such funds for end users as loans should be sufficient enough in order to help the smooth running of the banking business. However, the advent of POS and ATM machines reduces deposit funds capacity or volume of cash at banks because of the constant withdrawer by customers through these intelligence machines. This of course may affect the intermediation function of banks. Though, the e-banking tools has been viewed as a driving force that is causing a paradigm shift in the banking industry as well as making the banking business a more competitive one. This has stretched the e-banking boundaries between different financial institutions

frontiers, and has enables new financial services available in diverse packages but what about its effect on the basic function of banks? (Agbala, 2008; Prasert, Kanchana, Chukiat, & Monekeo, 2015; Carvalcio & Siegel, 2011; Madueme 2010).

Therefore, electronic-banking instruments are artificial intelligence machines such as automated teller machines (ATM), point of sales machines (POS), computers/its application software as well as telecommunications technologies that facilitate and perform banking business transactions with or without the help of humans. The emergence of artificial intelligence machines and its usage in Nigeria banking industry has disrupt the manual methods of banking by replacing it with automated (online-real-time) banking services tools. Such instruments makes banking operations convenient, accessible and friendly, even to the point where one can transact at the comfort of her home but how it affect financial intermediation of money deposits banks is a quest that requires interrogation. Holding to the fact that banks plays an intermediating role of sourcing/warehousing funds from surplus units and making them available to the deficits unit as loans/credits and charges interest in return. However, it is believe that the advent and usage of POS, and ATM machine instruments; where cash are readily made available for end users (customers), imperatively shorten the time frame that banks hold the funds for loan purposes. Therefore, the activities of these machines may have effect on the intermediating functions of money deposits banks especially in Nigeria where the rate of physical cash usage is high, also holding to the view that modern technology are disruptive in nature (Prasert et al 2015; Maiyaki & Mokhtar, 2010; Carvalcio & Siegel 2011).

Basically, through computer-and-telephone based systems, bank customers can check deposits, move money from one account to another, pay bills, set up new accounts, request for loans, and invest spare cash any time. E-banking has vastly reduced the physical transfer of paper money (cash) and coins from one place to another. Computer and electronic transfer technology can equally substitute cheques and other paper transactions. This can be initiated through devices like cards or codes that allow you to access your account. Many financial institutions uses ATM or debit cards or phone software application and personal identification numbers (PINS) for the purpose of transacting banking businesses (Anyanwokoro 1999; Aburine, 2008)

Generally, the successful usage of electronic banking tools, helps in cutting down cost of minting more of paper money, it enables the implementation of cashless policy, enable proper monitoring/control of financial crimes activities because it give room for audit trail. Consequently, as the society is discouraged from carrying excess cash due to government threshold policy, it should be able to promote the usage of e-money (e-cash) through banking tools in the Nigeria economy. And at the long run, such activity usage affects the volume of money in circulation and CBN monetary policy. Cash lodgment through e-banking tools has direct effect on narrow and broad money at large. Through cash-in transaction, currency outside bank enters into the banking system. These newly injected monies have multiplied effect. And at the receiving ends, when owners of the e-money is converted to the digital balance to be legal tenders which is a cash-out transaction, the physical cash that comes out of the banking system into the people's hand for usage, increases the cash outside bank and decreases the volume of money with the banks (Ahmed & Suliman 2011). Hence, it is expected that the bank intermediation function of using the optimum availability of deposited money for lending is affected as well.

Interestingly, not much research works have looked at the effect between e-banking instruments and financial intermediation function using bank deposits to credit ratio in Nigeria. Extant literatures, concentrated majorly on economic growth (GDP), like the work of (El.seoud & Sayed, 2014; Liang 2011; Shrestha 2010; Zapodeamu & Cociuba 2010; Oganmuyiwn & Ekone 2010). This study is different from others works in that it is centred on the link between e-banking instruments and bank deposits to credit ratio in Nigeria. Furthermore, the cashless policy implementation which has the objective of cutting down excess cash in circulation and creating the enabling environment for efficient intermediation function of the Nigeria banking system seems not to be achieving it purpose in term of high volume of cash withdraw/demand, cash holdings and usage through the ATM and POS machines. There is need to interrogates whether the advent of this policies/instrument has significant effect on the primary function

of banks. Hence, this study seeks to empirically investigate the effect of electronic banking instruments on the intermediation effectiveness which is bank credit to deposits ratio in Nigeria from 1998-2020 by looking at the following objectives: Automated teller machine (ATM) instrument on bank credits to deposits ratio in Nigeria.

1. To determine the effect of automated teller machine (ATM) instrument on bank credits to deposits ratio in Nigeria
2. To determine the effect of internet banking instrument on bank credits to deposits ratio in Nigeria.
3. To determine the effect of point of sale (POS) banking instrument on bank credits to deposits ratio in Nigeria.

2.1. Conceptual Issues

2.1.1. Banks Intermediation Functions

The intermediation function of banks refers to their role in channeling funds from savers to borrowers, thereby promoting economic growth and liquidity in the financial system. A key measure of this function is the credit-to-deposit ratio (CDR), which represents the proportion of total deposits that a bank lends out. A high CDR suggests that a bank is actively converting deposits into loans, supporting its intermediation role, while a low CDR may indicate a cautious lending strategy or low demand for credit (Okoye & Eze, 2020; Okoye & Omole, 2021). In Nigeria, the credit-to-deposit ratio has been an important metric for assessing banks' effectiveness in supporting economic activities. Following a mandate from the Central Bank of Nigeria (CBN) in 2019, Nigerian banks were required to maintain a minimum CDR of 65% to stimulate lending, particularly to the private sector. This regulation aimed to increase banks' intermediation activity by encouraging more funds to flow into productive sectors of the economy (Ibrahim & Yusuf, 2021). The policy led to a notable increase in bank lending, particularly in sectors such as agriculture, manufacturing, and small-to-medium enterprises (SMEs), areas that had previously struggled to access sufficient credit (Salami & Adeyemi, 2022).

While the CDR requirement has stimulated credit growth, it has also posed risks to banks' balance sheets. Some analysts have raised concerns that high lending targets might lead to a relaxation of credit standards, potentially increasing the risk of non-performing loans (Ogunbiyi, 2020). Moreover, certain banks have faced challenges in meeting the target, as deposit levels are often influenced by economic volatility and customer confidence. Despite these challenges, the CDR policy has had a substantial impact on bank intermediation, with many Nigerian banks expanding their lending portfolios to comply with regulatory expectations (Akande & Falana, 2023).

2.1.2. Electronic Banking (e-Banking)

Electronic banking, commonly referred to as e-banking, encompasses a range of digital tools and platforms that allow customers to conduct financial transactions without visiting a bank branch. These instruments include mobile banking, internet banking, ATMs, and point-of-sale (POS) systems, each contributing uniquely to enhancing accessibility, efficiency, and convenience in banking. E-banking has revolutionized financial services in Nigeria, enabling customers to perform tasks such as money transfers, bill payments, and balance inquiries from their devices or nearby ATMs, 24/7 (Adeyemi & Ola, 2019).

Mobile banking, for instance, has seen substantial growth, driven by the rapid expansion of mobile phone ownership and internet access in Nigeria. This tool enables customers to complete transactions via mobile apps or USSD codes, making banking accessible even in remote areas with limited banking infrastructure. Mobile banking has also enhanced financial inclusion by providing services to the previously unbanked population, a key objective for many Nigerian banks (Adewale & Okoro, 2021).

Internet banking, meanwhile, offers a more comprehensive suite of banking services, enabling users to manage accounts, set up recurring payments, and access detailed financial information. Though internet banking is primarily utilized by urban customers with stable internet connections, it has also streamlined business banking by allowing corporations to handle payroll, supplier payments, and financial monitoring online (Eze et al., 2020).

Automated Teller Machines (ATMs) and POS systems further complement e-banking services by facilitating cash withdrawals, deposits, and payment processing at locations outside of bank branches. ATMs have become essential for meeting cash needs, while POS terminals enable cashless transactions, particularly in the retail sector (Ibrahim & Lawal, 2023). Together, these electronic banking instruments support a seamless banking experience, improving transaction speed and reducing operational costs for both banks and customers.

2.1.3 E-banking instruments and Intermediation Function

Electronic banking has grown in Nigeria over the last decade, significantly affecting the financial landscape and banks' role as intermediaries. With the introduction and expansion of e-banking instruments like mobile banking, internet banking, and ATMs, Nigerian banks have increasingly automated transactions, reducing reliance on physical branches and making banking more accessible to the public (Oyetayo et al., 2020). This transformation has had profound effects on the banking sector's intermediation function, which traditionally involves mobilizing deposits and channeling them into loans for economic activities. One key impact of electronic banking is the improvement in financial inclusion. With mobile banking, for example, individuals in remote areas with limited banking infrastructure can now access financial services, fostering savings mobilization (Akinoyemi & Akinlabi, 2021). This shift has increased banks' deposit base, enhancing their capacity for credit creation. Moreover, e-banking has improved transaction efficiency and reduced operational costs for banks, strengthening their intermediation function and enabling faster loan processing times (Agboola & Ugoani, 2019).

However, electronic banking has also introduced challenges to banks' intermediation role, such as increased competition from fintech companies offering payment and loan services (Ojo, 2022). Fintech platforms provide quick, often collateral-free loans through mobile apps, which may reduce banks' role in direct lending. This competition pushes banks to innovate, potentially leading them to focus more on digital lending channels. Nevertheless, Nigerian banks are increasingly collaborating with fintech firms to retain their relevance, enhancing their intermediation role through digital partnerships (Eromosele et al., 2023).

3. Theory and Hypothesis Development

The theoretical foundation linking electronic banking instruments and banks' intermediation function is grounded in financial intermediation theory and technology acceptance theory. These theories together provide insights into how electronic banking tools like mobile banking, internet banking, ATMs, and POS systems enhance or alter banks' traditional role of mobilizing deposits and extending credit. Hence, financial intermediation theory highlights the core role of banks as intermediaries that channel funds from savers to borrowers, thus supporting economic activities and liquidity. Electronic banking instruments enhance this intermediation function by enabling banks to mobilize a larger volume of deposits through increased accessibility and convenience for customers (Adeoye & Adetunji, 2020). By extending services beyond physical branches, e-banking reaches previously underserved populations, contributing to greater deposit mobilization and thus increasing banks' capacity to lend (Ibrahim & Aliyu, 2021). Technology acceptance theory (TAM) provides a framework for understanding customers' adoption of electronic banking instruments. According to TAM, perceived usefulness and ease of use drive individuals' acceptance of new technologies, which is crucial for the success of e-banking initiatives (Davis, 1989; updated by Agboola & Udeze, 2019). In Nigeria, mobile and internet banking are perceived as convenient and accessible, leading to high levels of adoption, particularly among younger demographics. This widespread acceptance supports banks' intermediation function by expanding the customer base and increasing transaction volumes, which in turn boosts bank liquidity and lending capacity (Obafemi & Eniola, 2022).

The emergence of e-banking has significantly influenced deposit mobilization, credit provision, and overall financial inclusion, each of which are key components of the banking sector's intermediation role. Studies by Adeyemi and Lawal (2020) demonstrate that mobile banking has been especially influential in increasing financial inclusion, particularly among the unbanked population in Nigeria. Their research

found that the adoption of mobile banking led to a significant rise in the number of accounts opened, particularly in rural areas where bank branches are sparse. This expansion in deposit mobilization directly strengthens banks' intermediation function by increasing available funds that can be channeled into credit (Adeyemi & Lawal, 2020).

Further evidence from Okoro and Obafemi (2021) shows that internet banking has improved banks' operational efficiency, allowing for quicker and more efficient transaction processing. Their study, which analyzed data from ten Nigerian banks over a five-year period, revealed that internet banking significantly reduced the cost per transaction and increased loan processing speed. This efficiency gain enhances banks' capacity to provide credit and strengthens their intermediation role by reducing the overhead costs associated with traditional banking operations (Okoro & Obafemi, 2021).

Ogunbiyi and Olaleye (2022) examined the impact of ATMs and POS systems on customer satisfaction and deposit mobilization. Their study found that the convenience of ATMs and POS terminals has reduced the need for in-branch visits, leading to higher deposit volumes and transaction frequencies. With customers able to access cash and perform transactions easily, banks experience higher levels of deposit inflow, which in turn boosts their lending potential and ability to fulfill their intermediation function (Ogunbiyi & Olaleye, 2022).

Meanwhile, research by Ibrahim and Sani (2023) looked at the influence of electronic banking instruments on credit distribution. They found that banks offering more comprehensive digital services, such as mobile and internet banking, were able to extend more loans to SMEs due to the increased liquidity from higher deposits. Their findings indicate that electronic banking supports the intermediation function by enabling banks to meet the credit demands of businesses, particularly in underserved sectors of the economy (Ibrahim & Sani, 2023).

In the light of the empirical literatures, the hypotheses to be tested are stated in null forms:

- H0₁: To determine the effect of automated teller machine (ATM) instrument on bank credits to deposits ratio in Nigeria
- H0₂: To determine the effect of internet banking instrument on bank credits to deposits ratio in Nigeria.
- H0₃: To determine the effect of point of sale (POS) banking instrument on bank credits to deposits ratio in Nigeria.

3.1 RESEARCH METHODS

The study adopted the ex-post facto research design and the dataset were sourced from the Statistical Bulletin of the Central Bank of Nigeria. The annual time series data were converted to quarterly data to enable robustness of the series because of the limitation of the data prior to 2009. Hence, the data span from (2009Q to 2019Q). The Ordinary Least Squares (OLS) method was adopted for the estimation. Prior to the estimation, the Augmented Dickey Fully test was employed for stationarity and Johansen co-integration analysis was utilized to determine the presence of co-integrating relationships in the selected variables. As such, the electronic banking instruments of: automated teller machine (ATM), Web Pay/Banking (WEBB), point of sale (POS) are the selected explanatory variables, while Bank Credit to Deposit Ratio (BC2DR) as proxy for financial intermediation variable (Gujarati, 2003).

3.2. Model Specification

3.2 Specifications of the Model

The dataset are interrogated employing the OLS regression technique that is termed to be a statistical technique in finding relationships between variables for the purpose of predicting future values. Using the formula:

$$BC2DR = F(ATM, WEBB, POS) \dots\dots\dots 3.1$$

This can be written in explicit form as:

$$BC2DR = \beta_0 + \beta_1 ATM + \beta_2 WEBB + \beta_3 POS + \mu \dots\dots\dots 3.2$$

Where:

BC2DR is Bank Credit to Deposit Ratio, ATM is automated teller machine, WEBB is Web Pay/Banking (WEBB), and POS is point of sale. μ = Error Term, f = Functional notation.

The functional models above were further transformed into logarithms for standardization since the entire dataset are not in the same units of measurements and their magnitudes vary widely (Alley, Asekomeh, Mobolaji & Adeniran, 2014; Dimitrios & Stephen, 2007).

The log form of the model is stated thus:

$$BC2DR = \beta_0 + \beta_1L ATM + \beta_2LWEBB + \beta_3LPOS + \mu \dots \dots \dots 3.3$$

A priori expectation signs of parameters are that all the explanatory variables will have positive relationship with criterion variable.

From the trend analysis, we discovered that the dependent variable does not have steady increasing in rate over the years. The independent variables of ATM, POS and WEBB also do not have steady pattern of increase over the years. This indicates that there are a lot of fluctuations under the period of the study. There is no definite pattern in the movement of the variables as shown in the trend.

4.0 Data Presentation and Analysis

The descriptive statistics presented the output of the mean, median, maximum, minimum, standard deviation, kurtosis, Jarque-Bera, and probability for the data, the result is presented in table 4.1 below.

4.1 Summary of Descriptive Statistics.

Table 4.1: Summary of Descriptive Statistics

	BC2DR	LOG(ATM)	LOG(POS)	LOG(WEBB)
Mean	1.033415	19.75596	16.69287	15.81346
Median	1.042500	19.80723	16.85130	15.53597
Maximum	1.210000	20.59033	19.89913	18.45505
Minimum	0.880000	17.91208	13.73023	14.28619
Std. Dev.	0.089225	0.723994	2.053580	1.315530
Skewness	-0.281389	-0.984147	0.023097	0.574346
Kurtosis	2.297025	3.330379	1.647291	1.973320
Jarque-Bera	1.385275	6.804865	3.129591	4.054843
Probability	0.500255	0.033292	0.209131	0.131675
Sum	42.37000	809.9945	684.4078	648.3519
Sum Sq. Dev.	0.318447	20.96670	168.6876	69.22475
Observations	41	41	41	41

Source: Authors' computation using E Views 9.0

The summarized descriptive statistics revealed that financial intermediation in terms of bank credit to deposits ration (BR2DR), log of automated teller machine (ATM), log of point of sales (POS) and log of web pay (WEBB) are reported in Table 4.2. The normality test uses the null hypothesis of normality against the alternative hypothesis of non-normality. Hence, when the probability value is less than the Jacque Bera chi-square at 5% level of significance, the null hypothesis of the regression is not rejected. From the results in Table 4.2, it is apparent that the hypotheses of all the variables are normally distributed and cannot be rejected since all the probabilities are lesser than the JarqueBera chi-square distribution values. Therefore, they all pass the significance test at 5 percent level. All the predicting variables are transformed to “logarithm forms with the intention of minimizing any abnormality and nonlinearity that characterizes macroeconomic data”.

Below we present the unit root tests, Johansen co- integration test and OLS regression result. The unit root test provides information on the stationarity properties of the variables and it was conducted using the Augmented Dickey- Fuller (ADF) test. The co-integration test provides information on the existence

of a long run relationship between the dependent and explanatory variables and was performed using the Johansen methodology.

4.3 Unit Root Test Results

Based on stationarity test of time series, if the data series is differenced and it is found to be stationary, then they can be integrated to the same order of one or greater than one, otherwise a non-stationary series exists. If $n = 0$, the resulting $I(0)$ represents a stationary processes. If the time series are integrated into order $I(0)$ and they are at the same level, cointegration can be done. The unit roots test was evaluated using Augmented Dickey-Fuller (1981) for all the variables in this study. See Table 4.3 below.

Table 4.3: Unit root test result using ADF procedure for the model

(Source: Author's computation using E view 10)

Variables	Augmented Dickey Fuller Test			5% C. L.	d(I)	Remark
	@level	@ 1 st Diff	Lag			
BC2DR	-2.558938	-2.222987	2	-3.533083	I (2)	Stationary
Log(ATM)	-2.871014	-4.038710	2	-3.529758	I (1)	Stationary
Log(POS)	-2.914797	-3.529758	2	-3.529758	I (1)	Stationary
Log(WEBB)	-1.307113	-5.534438	2	-3.526609	I (0)	Stationary

Following the above table, it can be seen that all the variables are not stationary series at level and therefore fail the Augmented Dickey Fuller (ADF) unit root test. However, the unit root test of the variables indicates that ATM and POS variables are stationary at first difference I(1) series, while WEBB is stationary at level and BC2DR is integrated at second order I(2). Since all the variables are found non-stationary at levels, it is compulsory to difference them before estimation. Differencing the variables removes any long-run information contained in the variables of interest.

4.4 Johansen Co-integration Test Results

Cointegration analysis helps to determine the long-run relationship between integrated variables. The results are presented in Table 4.4. The outcome of the multivariate co-integration test using Johansen co-integration technique indicates that the trace statistic value confirms the existence of co-integrating equations among the variables. The trace test revealed two cointegrating equations while the maximum Eigen value also shows 0 cointegrating equations. Since the variables are co-integrated, the existence of a stable long-run relationship between variables is confirmed. It is therefore, satisfactory for our OLS regression model.

4.5 Simple Regression Analysis

Dependent Variable: BC2DR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.301190	0.622650	2.089762	0.0436
LOG(ATM)	-0.065962	0.035776	-1.843716	0.0732
LOG(POS)	-0.062215	0.027720	-2.244422	0.0309
LOG(WEBB)	0.131148	0.033826	3.877151	0.0004
R-squared	0.431914	Mean dependent var		1.033415
Adjusted R-squared	0.385853			
F-statistic	9.376987			
Prob(F-statistic)	0.000096			

Source: Computed Result Using (E-Views 9)

Table 4.5 show the effect of electronic banking instruments on financial intermediation in Nigeria. The regression result revealed R^2 value of 0.4319 and adjusted R^2 of 0.3859. This indicates that the selected variables (automated teller machine, point of sale and internet banking) can explain about 39percent

systematic change in financial intermediation of Deposits Money Banks in Nigeria. The F-statistic of 9.377 ($P < 0.05$) reveals that our overall model is significant at 5% level. Hence, the null hypothesis is rejected. This means that the independent variables of automated teller machine, point of sale and internet banking are jointly significant in determining financial intermediation efficiency in Deposits Money Banks of Nigeria.

In terms of the individual variables, it is observed that all the variables were significant except ATM. The result indicates that the coefficients of automated teller machine has a negative non significant effect on financial intermediation, whereas point of sale has a negative significant effect on financial intermediation; while internet banking has a positive significant effect on financial intermediation at 5percent level using the t-statistics. The a-priori expectations about the signs of the parameters were met in all the variables except ATM variable.

4.7 DISCUSSION OF FINDINGS

From the above result, it is obvious that the overall selected electronic banking variables of automated teller machine, point of sale and internet banking have significant impact on financial intermediation of deposits money banks. However, at the individual level, automated teller machine has negative non-significant effect on the dependent variable at 5% level. This means that an increase in the volumes of ATM transactions, will lead to a non significant decrease in financial intermediation of deposits money banks in Nigeria. Point of sale on the other hand, has a negative significant effect on the dependent variable at 5percent level. This implies that an increase in the volume of POS transactions will lead to a decrease in financial intermediation of deposits money banks.

Thirdly, internet banking (WEBB) has positive significant effect on the dependent variable at 5percent level. This suggests that an increase in internet banking transactions will lead to a corresponding increase in financial intermediation of deposits money banks in Nigeria. Therefore, it can be concluded from the overall regression result in table 4.5, that e-banking instruments (ATM, POS and WEBB) has significant effect on financial intermediation of deposits money bank in Nigeria.

5.1 CONCLUSION AND IMPLICATION

The study focused on specific transactions carried via ATM, POS and online banking and their influence on the banks' ability to channel funds effectively. The findings revealed that internet banking (WEBB) has positive significant effect on financial intermediation of deposits money bank in Nigeria. ATM, and POS on the other hand, have negative relationship with the criterion variable but only POS is significant at 0.05 level using the t-statistics. In light of the findings, banks should prioritize the expansion of Internet Banking services, as they positively influence financial intermediation. Efforts should be made to enhance the security, functionality, and user experience of Internet Banking to further promote its adoption and utility. Additionally, banks should carefully assess the deployment of ATMs and POS systems, as they do not contribute significantly or positively to intermediation. Future policies should focus on aligning electronic banking instruments with banks' intermediation objectives, ensuring that technological innovations support both financial inclusion and efficient resource allocation. Further research could investigate the specific conditions under which electronic banking tools may better support financial intermediation.

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