Paradigm Academic Press
Law and Economy
ISSN 2788-7049
OCT. 2025 VOL.4, NO.9

Automated Teller Machine Transactions and Performance of Deposit Money Banks in Nigeria: A Multivariate Approach

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doi:10.63593/LE.2788-7049.2025.10.001

Abstract

This study examined Automated Teller Machine transactions and performance of deposit money banks in Nigeria. To achieve this objective, the estimated model was to examine the impact of volume, value and number of ATMs on performance of deposit money banks in Nigeria. Adopting the OLS multiple regression technique, secondary data was obtained from Central Bank of Nigeria (CBN) statistical database on CBN website. The OLS regression results indicated that volume of ATM transactions has no significant influence on bank performance. While value of ATMs transaction and numbers of ATMs positively and significantly impacts on the performance of DMBs in Nigeria. The study concludes that ATM transactions are on the increase since its inception in Nigeria. To some extent, the outcomes of our study have justified the implementation of this initiative and ATMs has sufficiently impacted banking performance. It is recommended among other things that monetary authorities and managers of deposits money banks should increase the spread of ATMs terminals across the country since the efficient utilization of ATMs ultimately enhance bank performance in Nigeria.

Keywords: Automated Teller Machine (ATM), volume, value and number of ATMs, performance

1. Introduction

The two major services of banks in every economy are receiving deposits and advancing loan. These two services generate other services in the bank such as payments, withdrawal, transfers, etc. (Gichungu & Oloko, 2015). The effectiveness of any bank in providing these services depends very much on matching them with customers' needs in terms of ease at which customers are satisfied and time required to provide the service (Komai, 2009). In the past few years, Nigerian banks and the financial services industry in particular, have embraced the concept of e-money to offer superior services in order to improve customer satisfaction, competitiveness and profitability (Onyango, 2022). Innovations are beginning to take place in the Nigerian financial landscape and customers are increasingly raising the hope of expectations for quality customer services (Gwama, 2024). One of the notable innovations is the introduction of Self-Service Technologies such as the Automated Teller Machines (ATMs).

Automated Teller Machine (ATM), also known as an automated banking machine (ABM) or Cash Machine and by several other names, is a computerised telecommunications device that provides the clients of a financial institution with access to financial transactions in a public space without the need for a cashier, human clerk or bank teller (Fagan, 2017). According to Kahgan, Kharit and Chatham (2022), Automated teller machine (ATM) is an electronic banking outlet that allows customers to complete basic transactions without the aid of a branch representative. Using an ATM, customers can access their bank accounts in order to make cash withdrawals, credit card cash advances, and check their account balances as well as purchase prepaid cellphone credit. Since

the introduction of Automated Teller Machines (ATM) into the Nigerian market in 1989, there is no contesting the fact that the introduction of ATM has changed the face of electronic payment in Nigeria (Olumide, 2024). The use of ATMs attracts benefits to both the banks and customers in respect of time and place utility, reduction of service cost of depositors' demands, and increase in market share (Gichungu & Oloko, 2015). The ATM has made it possible for bank customers to access cash at any time irrespective of bank business hours (Ogunsemor 2022; Akrani 2024). According to Solomon (2016), the numerous benefits associated with the provision of ATM services in Nigeria are: that ATM allows for speedy completion of transaction, especially withdrawal even outside the country where the banker does not have a branch. It also reduces the number of customers' visit to their banks and it makes it possible for a customer to withdraw from any bank close to him 24/7. This benefit has tremendously enhanced bank performance and the country's move into cashless economy (Obiri, Kyere, & Kwarteng, 2023).

However, Mohammed (2020) in his study opined that ATM deployments and its use by customers is just gaining ground and it has also been characterized with some disadvantages such as fraud perpetration, network failure in time of dire need of money, ignorance in terms of services provided by ATM and large queue on ATM in the designated places. The recent removal of service charge pose another challenge, causing more patronage (Spur, 2022). With nearly 12,000 Automated Teller Machines, 131,000 point of sales machines, several internet payment portals and 25 million bank cards in circulation, the number of people with bank accounts grew from 18.3 million in 2008 to 28.6 million in 2012, 63.5 million in 2016 and currently around 134 million in 2021 (WDI, 2022). Furthermore, since CBN introduced Cashless Policy in 2012 and the Financial Inclusion Strategy in 2012, the reliance on ATMs for cash withdrawal have persisted.

This is reflected in CBN's data on electronic payment transactions, which shows persistent increase in the number, volume and value of ATM transactions between 2011 and 2020 (CBN, 2020). According to the CBN, the value of ATM transactions rose by 650 per cent to 12 trillion at the end of August 2020 from 1.6 trillion in 2011 (Adegbesan, Akinsanmi & Ariyo, 2020). During this period the volume of ATM transactions rose by 347.6 million to 968.4 million from 2011 to 2020. In spite of the rising prominence of electronic payment channels and the wide acceptance of ATM banking services by the citizenry, the performance of banks has continued to experience slow decline in revenues, reflected by the risks, reliance and associated cost of using ATM banking services (Okoro, 2024; Jegede, 2024, Minskey, 2020). It is against this backdrop that this paper tends to investigate the effect of Automated Teller Machine transactions on the performance of banks in Nigeria. The motivation for this study stems from the fact that only limited empirical studies in this area have so far been carried out in most emerging countries, particularly in Africa. Conducting research of this nature using the Nigerian environment will reduce the knowledge gap to the barest level.

The specific objectives are:

1) To examine the extent to which a number of ATM machines affect bank performance in Nigeria.
2) To investigate the volume of ATM transactions and its impact on bank performance in Nigeria.
3) To investigate the effect of the value of ATM transactions on bank performance in Nigeria.

2. Theoretical Framework

The theory underpinning this study is the technology acceptance theory, other supporting theories are Diffusion theory and unified theory of acceptance and use of technology.

2.1 Technology Acceptance Theory

The technology acceptance theory (TAT) was first proposed by Davis, Bagozzi and Warshaw in 1989. The theory suggested that using an information system is directly determined by two factors: perceived usefulness (PU) and perceived ease of use (PEOU) of the new technology. Perceived usefulness of technology suggests the personal conviction to better the degree of work performed by a specific new technology or information system. While perceived ease of use of new technology implies how easy a person can learn the way to use or run a new technology or information system (Scott & Davis, 2015). The theory is relevant in the study because it is used to explain how banks adopt electronic banking. To understand, predict and explain why people accept or reject information systems; researchers have developed and used technology acceptance theory (TAT) to understand the acceptance of users of the information systems. Hence, the technology acceptance theory is a key theory that underpins the current study on how e-banking impacted on the performance of deposit money banks in Nigeria.

2.2 The Theory of Consumption Value (TCV)

The Theory of Consumption Value explains consumer's behavior as regards making choices between various products/services (Sheth et al., 1991). It provides a theoretical foundation for payment technology use. Payments are no longer about transacting with cash but also about the consumer's behavior towards payment choices and their perceptions of the various technologies. We will discuss below 4 consumption values in the context of

payment technology use:

1) Functional value: This is based on economic utility theory, it assumes the economic rationality of the consumer and relates the attributes of a product or service such as performance, price, quality, and reliability that would influence this rationality (Humphrey, 2020).

2) Social value: This involves highly visible products, services and/or objects and how they are perceived by consumers. Under this, a product or service is chosen more for the perceived social image or symbolic importance it is assumed to convey than for functional performance. For example, ATM card payments or a stack of banknotes.

3) Emotional value: In this situation, the consumers' decisions are influenced by the product's potential to arouse emotions (positive or negative) with its use. An example of this is the emotional value attached to beauty and artistry products like manicure, pedicure, massages, painting etc.; their values are usually tied to how the customer felt. In the context of payment, the emotion that can be aroused is the so-called "pain-of-paying" which is associated with the transparency of the paying process (Soman, 2021).

4) Conditional value: This applies to products or services, whose value is dependent on a specific context like location or time. It answers the question — "it depends". This means that the choice to pay in a certain way can be influenced by for instance, the location (on the street, in-store or online) or the time (at the end of the month when salaries are paid or mid-month).

3. Literature Review

Several studies attest to the positive and negative impact of e-banking on the performance of banks in both developing and developed countries (Boyd, Graham & Hewitt, 2023; Rime & Stiroh, 2023; Osamuony & Emeni, 2017). However, only a few of such literature focus solely on ATMs in Nigeria. For instance, Furst, Lang and Nolle (2022) examined the influence of electronic banking on profitability amongst United States national banks using regression and correlation for analysis. Findings revealed that bank profitability has a strong correlation with e-banking in all US national banks. However, the study emphasized that in large banks in the urban areas, bank profitability has no relationship with e-banking because those banks merely use e-banking for competition purposes and not for profit making. Hagan, Maccario and Zazzara (2015) investigate the impact of e-banking on the performance of commercial banks in Italy. The study adopted the panel data analytical methodology. Return on asset (ROA) and return on equity (ROE) were used as dependent variables while internet banking, mobile banking, agency banking and Volume of POS were used as independent. Findings showed that e-banking has significant effect in both ROA and ROE of commercial banks in Italy. Hence, the study concluded that e-banking significantly affects commercial banks performance in Europe.

Josiah and Nancy (2022) investigated the effect of e-banking on performance of 27 commercial banks in Kenya using the person product moment correlation coefficient test as the analytical tool. The study adopted return on asset (ROA) as the dependent variable while investment in electronic banking, number of card issued by the banks and ATM installed by the banks served as the independent variables. Findings revealed that e-banking has a strong positive effect on return on asset (ROA) of banks in Kenya. DeYoung, Lang and Nolle (2017) identified 424 community banks which adopt e-banking and 5,157 banks without e-banking in the United States and compared the changes between 1999 and 2001. They examined the banks from three aspects: income statement items (ROA and ROE), asset and liability in balance sheet. The results found that bank's profitability can be enhanced by adding the electronic delivery channels and can especially increase income through charging deposits services and additional fee-based services. In addition, electronic banking could be a product innovation to improve the quality of traditional banking products and innovation that has changed the way of checking accounts and deposit.

Akhisar, Tunay and Tunay (2015) investigated the effects of electronic-based banking service on the profitability of 23 commercial banks in both developed and developing countries from 2005 to 2013. The study adopted the panel data analytical methodology. Number of branches to number of ATM ratio, point of sale (POS) and web (internet) banking service as the explanatory variable while return on equity (ROE) and return on asset (ROA) were the dependent variables. Finding revealed that ratio of number of branches to number of ATM has positive and significant effect on banks profitability in both developed and developing countries. However, POS and web (internet) banking have negative relationship with banks profitability. Yunus and Waidi (2011) investigated the nexus between electronic banking employees and customers responses, and bank performance in Nigeria using a sample of fifteen (15) commercial banks. The questionnaire descriptive research design was adopted using as sample of 123 respondents. Findings indicate that technological innovation has a strong influence on bank employees and customer satisfaction thereby having a strong effect on banks' profitability in Nigeria. Similarly, Abaenewe, Ogbulu and Ndugbu (2023) examined the relationship between electronic banking and bank performance in Nigeria using a descriptive analytical methodology. Four (4) banks were randomly selected using

the preadoption and post adoption era of electronic banking in Nigeria as the scope of the study. Return on asset and return on equity both served as the dependent variables. Findings revealed that electronic banking has a positive and significant effect on return on equity (ROE) of Nigerian banks but has no significant effect on return of asset (ROA).

Shehu, Aliyu, and Musa (2023) investigated the effect of electronic banking products on the performance of Nigerian listed deposit money banks (DMB) using six (6) Deposit Money Banks (DMB). The dependent variable was return on equity while the independent variables include E-Direct, SMS alert, E-mobile and ATM. Findings revealed that E-Direct has a negative and insignificant relationship with the profitability of Deposit Money Banks (DMB) in Nigeria. Adewoye (2023) investigated the impact of mobile banking on service delivery in the Nigerians commercial banks using a sample of 125 respondents. The study adopted frequency tables, percentages, mean score and chi-square test as analytical tools. Findings revealed that mobile banking improves bank service delivery in the form of transactional convenience, savings of time, quick transaction alert and savings of service. Cost among others. The study concluded that mobile banking has improved customers satisfaction thereby increasing the profitability of the commercial banks in Nigeria.

Obiekwe, and Mike (2017) investigated the effect of electronic payment method (EPM) on the profitability of commercial banks in Nigeria. A total sample of five (5) banks was considered for the period of 2009 to 2015 and the study adopted the panel least squares (PLS) estimation technique as the analytical tool. Findings revealed that automated teller machine (ATM) and mobile phone payment have significant effect on the profitability of commercial banks in Nigeria. While point of sale (POS) has an insignificant effect on commercial banks profitability in Nigeria. The study recommended among others, that commercial bank in Nigeria should sponsor media campaigns in order to boost the awareness on Automated Teller Machine (ATM) payment and mobile phone payment methods so as further increase their profitability.

4. Research Methodology

The research design adopted in this study is ex-post facto and descriptive research design. According to Cohen, Manionard and Morison (2020), the ex-post facto research design is the type of design used in examining possible antecedent of events that have already occurred which cannot be manipulated. The data used in the estimation of the model were obtained from secondary sources from the CBN statistical bulletin and bank financial statements.

4.1 Model Specification

The econometric model to consider in this study takes the number of ATMs, the value of ATMs and the volume of ATMs transactions the independent variables, while bank profitability was the proxy for bank performance, being the dependent variable. It is given by the equation:

$$\text{Formula: } Y = f(X)$$

Where,

Y = dependent variable.

X = independent variable.

The equation is thus:

$$Bperf = f(NATM, VAATM, VOATM) \text{----------(i)}$$

Thus, the econometric model of this study is:

$$Bperf = go + ßl\ NATM + ß2PVAATM + ß3VOATM + e \text{ ----------(ii)}$$

Represented in their log form

Where:

BPRF = Bank performance (bank credit as percent of bank deposits)

NATM = Number of Automated teller machines per 100,000 adults

VAATM = value of ATM transactions in circulation

VOATM = volume of ATM transactions

Ln = Natural log of numbers; e = Error term; B_0 = Interception; $\beta_1 - \beta 3$ = Slope coefficient

4.2 Description of Variables.

BPF = is used in this study to measure bank performance, it is the financial resources provided to the public by deposit money banks as a share of total deposits. DMBs are commercial banks that accept transferable deposits and make withdrawals through ATMs.

NATM = is the number of automated teller machines (ATMs) per 100,000 adults.

VAATM = is the price to be paid or actually paid for using ATM terminals.

VOATM = is the total number of transactions processed from, to or through the services and platform by ATMs service provider during any applicable period.

5. Data Analysis

The variables for value of ATMs and volume of ATMs transactions were transformed to their log form to address the problem of large values and avoid heteroskedasticity.

5.1 Descriptive Statistics

The result of the descriptive statistics is presented in Table 1. The analysis revealed that the bank performance (BPRF) has a mean value of 64.35154 with a standard deviation of 10.70505 having its minimum value as 45.98000 in 2012 and its maximum value of 83.75000 in 2016. The total volume of automated teller machine (ATM) transactions shows its minimum value as 17.91208 in 2015 and maximum of 20.59033 in 2020; with a mean volume and standard deviation of 19.83687 and 0.825014 respectively. Further analysis of the descriptive statistics revealed that total value of automated teller machine transactions (VAATM) shows its minimum value as 5.990739 in 2015 and maximum of 8.820106 in 2020; with a mean value and standard deviation of 8.01626 and 0.956314 respectively. Finally, the total number of ATMs per 100,000 (NATM) revealed its mean value as 16.01462 with a standard deviation of 0.8955560 having its minimum value in 2012 as 13.76000 and its maximum value of 17.19000 in 2020. From the descriptive analysis, the standard deviation for the volume of ATMs, value of ATMs and number of ATMs are all showing lower percentages of 0.82, 0.95 and 0.89 respectively compared to higher percentage of 10.70 for bank performance. Hence, bank performance with higher positive value shows wide dispersion from the average.

Table 1. Descriptive statistics

	BPERF	**LN_VOATM**	**LN_VAATM**	**NATM**
Mean	64.35154	19.83697	8.010626	16.01462
Median	63.35000	19.88760	8.286585	16.15000
Maximum	83.75000	20.59033	8.820106	17.19000
Minimum	45.98000	17.91208	5.990739	13.76000
Std. Dev.	10.70505	0.825014	0.956314	0.895560
Skewness	0.133498	-1.202873	-1.094974	-1.272498
Kurtosis	2.224164	3.518331	2.932761	4.360305
Jarque-Bera	0.364654	3.280484	2.600215	4.510696
Probability	0.833329	0.193933	0.272503	0.004837
Sum	836.5700	257.8807	104.1381	208.1900
Sum Sq. Dev.	1375.177	8.167784	10.97445	9.624323
Observations	13	13	13	13

Source: E-views 11.0 statistical software.

Furthermore, the analysis indicated that the measurement of skewness showed that only the volume of ATMs (VOATM) was rightly skewed (positively skewed) while BPRF, VAATM and NATM were found to be left skewed (negatively skewed). The coefficient of the kurtosis of VOATM and NATM indicated that the variable was found to be peaked (3.00 and above) (Leptokurtic) relative to the normal distribution while BPRF and VAATM were found to be below 3.00. The Jarque-Bera (JB) test measures the difference of skewness and kurtosis of the series with those from the normal distribution. The JB value of 4.51069 for NATM with corresponding probability values of greater than or equals to 0.05 percent confirms the normality of the series and suitability for generalization.

5.2 Residual Diagnostic Test Results

Diagnostic tests were conducted to know whether the model is valid or not and determine if the result of the regression is suitable for policy recommendations.

5.2.1 Residual Diagnostic Test Results

Diagnostic	Observed values	p-values
Breusch-Godfrey serial correlation LM Test	1.715929	0.2475
Breusch-Pagan-Godfrey Heteroskedasticity test	0.585120	0.6397
Ramsey RESET test	0.292990	0.7770

Source: E-views 12.0 statistical software.

The result of the diagnostic tests above showed that the model was free from serial correlation because the Breusch-Godfrey serial correlation LM test accepted the null hypothesis of no serial correlation in the residual. Similarly, the Breusch-Pagan-Godfrey Heteroskedasticity test both had their probability values to be greater than the 5% level, indicating that the model was normally distributed and free from Heteroskedasticity, respectively. Further, the Ramsey specification reveals that the model is well specified with f-stats probability value greater than 5%.

5.3 Summary of Findings

This study examined the Automated Teller Machines (ATM) transactions and performance of deposit money banks in Nigeria. To achieve this objective, the estimated model was to examine the impact of volume, value and number of ATMs on performance of deposit money banks in Nigeria. Adopting the OLS multiple regression technique, the following findings were made:

1) Volume of ATM transactions showed a negative and insignificant impact on bank performance in Nigeria. Hence, the null hypothesis that volume of ATM transactions has no impact on bank performance in Nigeria is accepted.
2) Value of ATM transactions showed a positive and significant impact on bank performance in Nigeria. We therefore accepted the alternative hypothesis that value of ATM transactions significantly affect bank performance in Nigeria.
3) Number of ATMs per 100,000 showed that there was a positive and significant impact of number of ATM transactions on bank performance in Nigeria. We therefore accepted the alternative hypothesis that Number of ATMs per 100,000 does affect bank performance in Nigeria.

6. Conclusion

This study investigates the impact of Automated teller machine (ATM) on bank performance in Nigeria. The study concentrates only on ATMs bank performance. Hence, the data for the econometric analysis of this study are annual data series of the volume of ATMs, value of ATM transactions, and number of ATMs per 100,000 and bank performance (measured as bank credit to deposits). The data were obtained from Central Bank of Nigeria (CBN) statistical database on CBN website. The study concludes that ATM transactions are on the increase since its inception in Nigeria. To some extent, the outcomes of our study have justified the implementation of this initiative, and ATMs has sufficiently impacted banking performance. One can say with some degree of certainty that the ATM transactions is impacting positively on the performance of banks in Nigeria.

7. Recommendations

From the findings, the study makes the following recommendations for policy and practice:

1) Managers of deposits money banks should look for ways to increase the volume and usage of automated teller machines that will significantly influence bank performance. Efforts should be geared towards the increased use of ATMs and installation of modern ones in line with the objectives of the cashless policy.
2) Monetary authorities and managers of deposits money banks should increase the spread of ATMs terminals across the country since the efficient utilization of ATMs ultimately enhance bank performance in Nigeria.
3) Since the number of ATMs had a positive significant impact on bank performance, it is recommended for deposit money banks to continuously increase the number of automated teller machines in the country especially to rural areas.
4) Banks should provide increase in customer education on usage of ATM machine through mass media such as television, bill board and radio as well as paste directive posters at every ATM centres across the country.

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