An Empirical Evaluation of the Effect of Automated Teller Machines Investment on Cost Efficiency of Banks in Nigeria

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ABSTRACT— ***Banks in Nigeria have increased their investment in ATMs as a major e-banking tool to generate substantial contributions to their operations and financial results. Among the expectations of the banks in deploying and usage of ATMs is improving efficiency particularly cost efficiency. There is, however, no clear evidence of banks achieving the desired returns from ATMs investments in the Nigerian banking environment.***

The main objective of this study was therefore to analyze the effect of the intensity of ATMs deployment on the cost efficiency of banks in Nigeria. The study was carried out on twenty two commercial banks quoted by the Nigerian stock exchange in year 2012 from which twenty were selected. Secondary data obtained from the six years financial reports and internal operational records of the banks were analyzed using both descriptive and inferential statistical tools.

In evaluating the effect of ATMs investment on the operating cost rate and Asset management rate of banks in Nigeria, four variables were used, intensity of ATMs as main independent variable and bank size, salary level as well as non-performing loans being control variables. Intensity of ATMs, bank size and salary level were found significant.

The result revealed that the intensity of ATMs deployment made positive contribution to the cost efficiency of Nigerian banks.

Keywords— Information and Communication Technology (ICT), Automated Teller Machine (ATM), ATM investments, ATM intensity , Cost Efficiency.

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1. INTRODUCTION

The banking industry in Nigeria is investing greatly in information and communication technology (ICT) given the highly information sensitive nature of the industry which is in line with global trend. Banks invest in ICT consistently to achieve cost savings and enhance customers' satisfaction (Chin – S, Shin -Yuan, David and Fang – Chun, 2008). Although earlier studies from the mid 1980s until the mid 1990s theoretically justified the advantages of IT, but they obtained contradictory empirical evidence, empirically weak or no link between ICT and firm performance. (Brynjolfsson, 1993; loveman, 1994; Roach,1987; Strassmann, 1985,1990). Subsequent researches have provided empirical evidence of positive and statistically significant relation between ICT investment and some measures of business performance.(Dewan and Min, 1997; Lichtenberg,1995; Brynjolfsson and Hitt.1995.1996)

Automated Teller Machine (ATM) has become a major indicator of ICT investment by banks. Globally, Automatic Teller Machines (ATMs) have been adopted and are still being adopted by banks. They offer considerable benefits to both banks and their depositors. The machines can enable depositors to withdraw cash at more convenient times and places than during banking hours at branches.(Olatokun and Igbinedion ,2009)

These potential benefits are multiplied when banks share their ATMs, allowing depositors of other banks to access their accounts through a bank's ATM (McAndrews, 2003). Banks have become the principal deplorers of ATMs because the cost of a single transaction performed at an ATM is potentially less than the cost of a transaction conducted from a teller, as ATMs are capable of handling more transactions per unit of time than Tellers (Laderman, 1990).

In Nigeria the adoption of ATM by banks and its use by bank customers is just gaining ground and has burgeoned in recent times. This has happened especially after the recent consolidation of banks, which has in all probability, made it possible for more banks to afford to deploy ATMs or at least become part of shared networks (Fasan, 2007). There has been growing investment in ICT devices by banks without any definite study on the impact of these investments especially in terms of ATM deployment and cost efficiency. This study is expected to fill this gap by analyzing the effect of the deployment of ATMs on the cost efficiency of Nigerian banks in order to justify its level of investment.

This study by measuring the effect of ATMs deployment on the cost efficiency of banks will provide more convincing evidence to understand the returns of ICT investment in the banking industry and by implication the extent to which Nigerian banks investment in ATMs has contributed to improving the cost efficiency of the banks. To achieve the objective above, the following hypotheses were tested;

i. ATMs deployment have no significant effect on the operating cost rate and
ii. ATMs deployment have no significant effect on the asset management rate of Nigerian banks

The findings from this study would provide useful information for banks, ATM firms and researchers to understand better the relationship between ATM investment and firms cost efficiency. It would therefore assist management in ICT investment decision making.

2. ADOPTION OF ATM BY BANKS IN NIGERIA

Automated Teller Machine (ATM) was conventional introduced in Nigeria as an electronic delivery channel in 1989 and was first installed by National cash registry (NCR) for the defunct Society General Bank of Nigeria in the same year. They were operated as elitist services designed for those desirous of exclusive service. Cards were rare and the process for obtaining them tortuous.

Agboola (2006) indicated that although only a bank had an ATM in 1998, by 2004, fourteen of them had acquired the technology. He observed that the adoption of ICT in banks has produced largely positive outcomes such as improved customer services, more accurate records, ensuring convenience in business time, prompt and fair attention and faster services etc.

Fanawopo (2006) opined that Nigeria's debit card transactions rose by 93 per cent between January 2005 and March 2006 over the previous year's owing to aggressive roll out initiatives by Nigerian banks, powered by Interswitch Network. According to him more than 800 ATMs have been deployed on the network, while about 2 million cards have been issued by 23 banks as at March,2006.

A survey conducted by Intermarc Consulting Limited revealed that ATM services provided by banks and non-financial institutions stood as the most popular e-business platform in Nigeria (Intermarc Consulting Limited, 2007). Modern banking services such as electronic banking, Internet Banking, Point of Sales (POS) transactions, money transfer, ATMs emerged as the most popular with 96 percent awareness level. ATM awareness also ranked higher than awareness level about current accounts and slightly below savings account (Omankhanlen, 2007). Initially banks try to induce and encourage customers to embrace the technology by not charging customers any fees for using ATMs. In time, some banks started charging customers for not using ATMs, that is a charge for each time a customer uses a Teller for a service that could be performed by an ATM..

According to Central Bank of Nigeria (CBN) Annual Activity report (2005), post consolidation of the banks in 2005, the number of ATM deployed by the banks in Nigeria rose from 184 in 2004 to 425 in 2005 with 131percent increase. CBN (2009), reported that the upsurge of ATMs as a dominant payment channel with 84.51 percent and 80.08 percent in volume and value of transactions respectively had continued at the end of June, 2009.The CBN report (2011) revealed that ATM remained the most patronized accounting for 98.8 percent with a transaction worth of 764.14 million naira.

The intense competition among banks trying to carve a niches in the stock market and heavy personnel expense pressure, alongside the large size of potential customer patronage (as a result of the large population of the country) makes ATM adoption for banks very crucial.

In the Nigerian banking environment, there is a tremendous growth in the deployment of ATMs but without a clear evidence of the specific factors that drives it as there appear to be limited previous studies that have focused on this.

3. ICT INVESTMENT AND BANKS PERFORMANCE

Past studies found inconclusive relationship between IT investments and the profitability of banks. The relationship can be seen to be insignificant especially in the short run due to high costs of investments in ICT (Furst, Nolle and Robberson, 1999; Furst,Lang and Nolle, 2002;Sullivan, 2000; Say the, 2005; De-young, 2006; Siam ,2006)

However latest studies seems to find a positive relationship between ICT and profitability. Milne(2006) supported this view when he stated that modernization of IT has set the stage for extraordinary improvement in banking procedure throughout the world. Brynjolfsson and hit (2002) study revealed that IT brings down the operational costs of the banks. Internet technology facilitates and speed up banks procedures to accomplished standardized and low value added transactions. Previous studies in Nigeria did not depict any significant empirical relationship between ICT investments and the profitability of banks in Nigeria(Adewoye, 2007). Ugwuanyi and Ugwuanyi (2013) suggests that IT expenditure has a negative relationship with banks profitability due to the fact that investment in IT increases expenditure as well as increases assets, thereby reducing operating profits as well as return on assets(ROA). Studies have confirmed the benefits of ATM investments to banks profitability in Nigeria (Olatokun and Igbinedon, 2007). What remain unexplored is the exact relationship between the level of IT expenditure most especially ATM expenditure and the profitability of banks in Nigeria

4. ATM INVESTMENT AND COST EFFICIENCY

There is however limited studies on the linkage between ATM investment and cost efficiency in developing countries. In terms of reduction in cost of operation, Batiz-Lazo and Barrie (2005) study argued that during the 1990s, Information Technology in banking (as measured by ATM) led to reduced operating costs, coupled with increased output (number of transactions) that resulted in greater efficiency. The authors concluded that the introduction of ATM was profitable for banks as well as customers. Their study indicated that the adoption of ATM by banks was of overall benefit to banks in developed countries.

In Nigeria information and communication technology has revolutionised banking, transforming it into a vibrant enterprise (Adeosun, Adeosun and Adetunde, 2005;Oghenemkeybe, 2007: Adewoye, 2007,2011). The transformation implies that the Nigerian banking industry has continue to invest in information technology. Ayantokun (2008) reported that Nigeria commercial banks spent 114 million dollas yearly on information technology equipment in 2008.

Within the banking sector in Nigeria, there is obvious increase in the deployment of Automated Teller Machines (ATM) along with other ICT based devices indicative of the fact that banks have channeled substantial financial resources on ICT investment.

ATMs have been acclaimed to be able to process routine transactions and therefore a close substitute to Teller labour (Chin-S *et al.*, 2008: Jayamaha .2008). They stated that investment in ATM result in ATM labour substitution effect which lower the operating cost and thereby improve their cost efficiency of banks. Labour substitution arises, therefore, when the use of ATM reduces Tellers' work with the attendant decrease in labour demand of banks. So banks with heavy personnel expense pressure tend to install more ATM to replace Teller labour costs.

Chin-S et al., (1980) confirmed that ATM intensity has positive effect on bank cost efficiency. In addition, they found that bank scale is also positively related to cost efficiency, while non-performing loans and salary level have negative impact

As for sustainability of income gained, earlier adopters could have cost improvements by replacing tellers with ATM. The conclusion was consistent with Laderman (1990) that ATM could reduce human resource costs of tellers and branch establishment costs.

According to Haynes and Thompson (2000), ATM can process routine transactions and therefore reduce tellers' work indirectly. He further stated that this will also decrease the labour demand of banks. In the same vein they observed

that banks with heavier personnel expense pressure tended to install more ATMs to replace teller labour costs, because of the substitution effect and operating cost consideration aiming to achieve the goals of operation efficiency**.**

The contribution of ATM investment to the banking industry in Nigeria has not been adequately quantified despite several studies that have discussed the impact of ATM investment in the banking sector.

There are dearth of data and research providing evidence of Nigerian banks achieving a lower operating cost as a result of the effect of labour substitution due from ATM investment despite the impressive growth of ATMs deployment. This has provided a gap needed to be filled by this study. The gap could have far reaching ICT investment implications, such as wrong investment policy, increasing labour expenses, low profitability even with increasing ATM investment.

Apart from ATMs there are other complimentary factors that influence the cost efficiency of banks. Previous studies have indicated that bank size, salary level and non-performing loan ratio also influence the cost efficiency of banks (Chin S et al., 2008) and Girardone et al., 2004). It is important that this study consider the effects of these factors on the cost efficiency of Nigerian banks. This study obtained data on the actual number of ATM, operating data and financial data of the banks to provide the actual ATMs investment data for measuring the effects of the intensity of ATM on cost efficiency of Nigerian banks.

5. SCOPE OF STUDY

The study period covered the five post merger and consolidation years from 2007 – 2012. This period has been chosen because it was the period that actually witnessed major development in ICT investment in banks as indicated by the increased level of ATM deployment (Fasan, 2007).

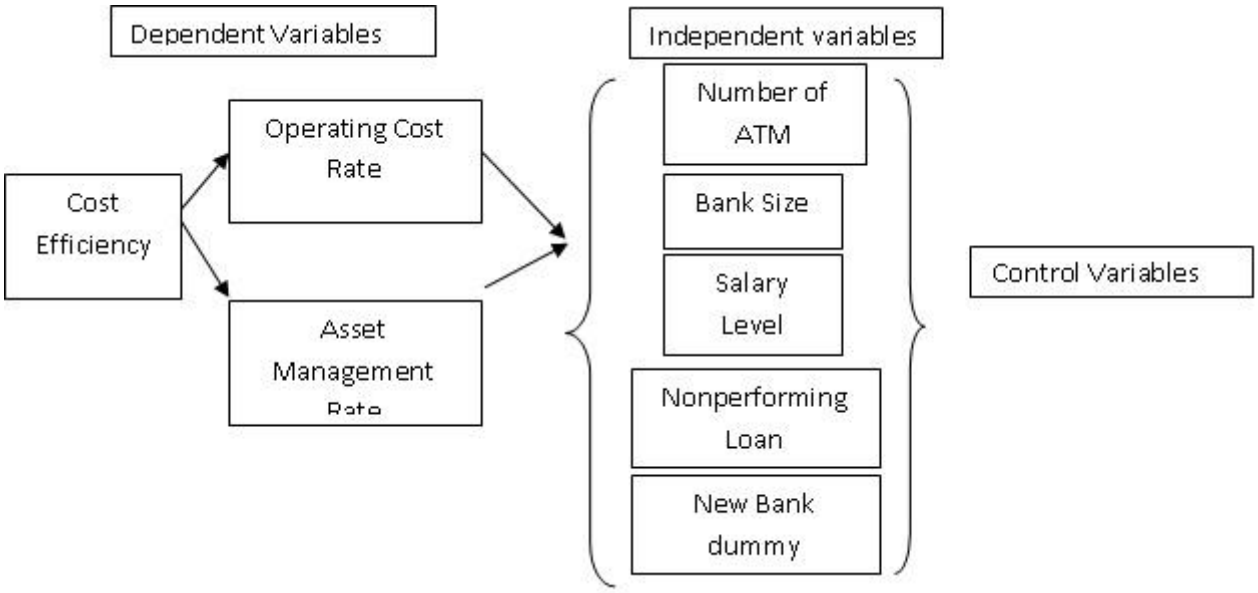
6. THEORETICAL AND CONCEPTUAL FRAMEWORKS

Chin-S et al., (2008), in their study to determine if ATM investment can improve bank cost efficiency adopted the simple traditional accounting/financial performance indicators by choosing operating cost rate and asset management rate as dependent variables while the main independent variable was number of ATM relative to labour utilization. In order to provide for any exogenous bias they included control variables such as bank size, salary level, non performing loan and new bank dummy.

This study has adopted this approach in estimating the effect of ATM intensity on the cost efficiency of Nigerian banks because the essence of the study was not to embark on measuring the efficiency of banks but given any obtained cost efficiency to evaluate how the cost efficiency has been affected by the intensity of ATMs deployment.

Chin S et al.,(2008) modeled a relationship between Cost efficiency and ATM Intensity controlling for bank size, salary level, non performing loan and bank age as independent variable and an output measure using operating cost rate and asset management rate for cost efficiency (dependent variable) as represented in figure 2. below:

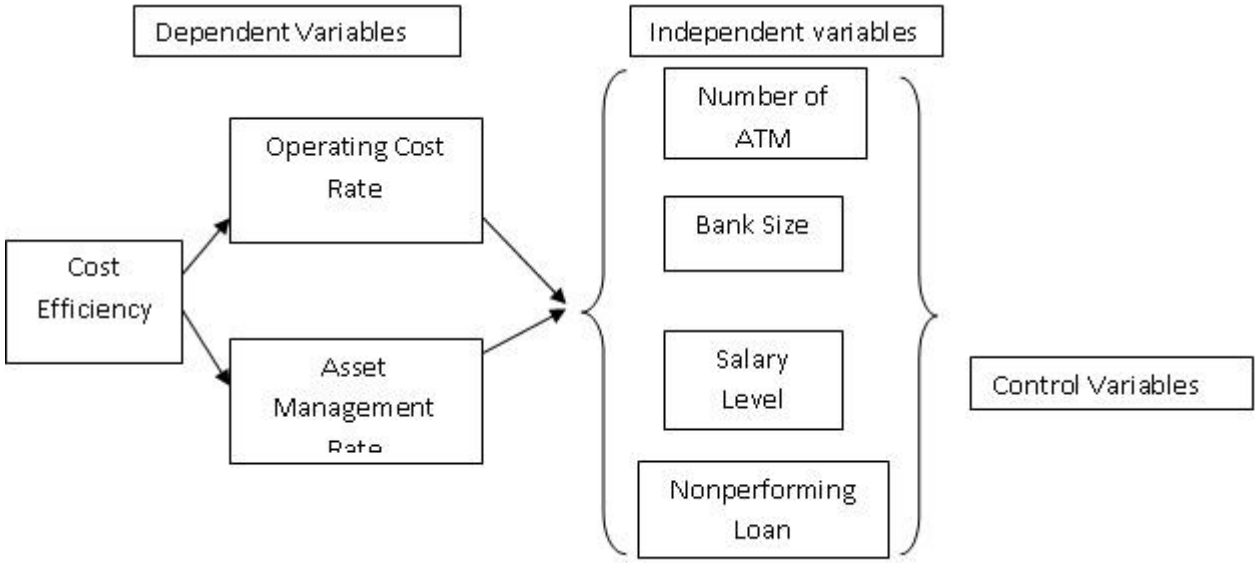
Fig. 3: The impact of ATMI deployment on cost efficiency



Source: Chin S et al., (2008)

The purpose of this study is to empirically evaluate the effect of automated teller machines investment on the cost efficiency of banks in Nigeria.

Figure 4: The impact of ATM deployment on cost efficiency



Source: Chin S et al., (2008)

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7. METHODOLOGY

MODEL FORMULATIONS

Ordinary Least Square Regression model explained

An Ordinary Least Square Regression Model for this study is written as:

$$Y = a + b(X_1, X_2, X_3 \ldots\ldots\ldots X_n)$$

The Regression model demonstrates the relationship between the dependent variable (Y) and the independent variables ($X_1, X_2, X_3 \ldots\ldots\ldots X_{n)}$.

For the purpose of making comparison about the contributions of the independent variables to the dependent variable the equation has been stated in multiple regressions along with their respective coefficients for each year as follows

Model 1: This equation was used to explain the relationship between the dependent variable (Cost Efficiency) and the independent variables (IATM deplored and the control variables)

$$Yiy = \alpha 0 + \alpha X_1 y + \alpha X_2 iy + \alpha X_3 iy + \alpha X_4 iy + \varepsilon iy \ldots\ldots\ldots\ldots\ldots\ldots \text{Model 1}$$

Where

Yiy = Cost Efficiency of bank i in year y

X_1iy = Number Automated Teller Machine of bank i in year y

X_2iy = Bank size of bank i in year y

X_3iy = Salary level of bank i in year y

X_4iy = Nonperforming loan ratio of bank i in year y

εiy = Error factor

The study area was Lagos, the commercial nerve centre of Nigeria, where almost ninety percent of the commercial banking activities takes place. It is also in Lagos that most of the commercial banks have their headquarters..

The study population consisted of the 22 Commercial banks in Nigeria quoted by the Nigerian stock exchange, with branches all over the country. The sample size was 20 out of the 22 commercial banks whose headquarters are in Lagos, the remaining two have their headquarters in Abuja and were therefore excluded purposively

This implies that results obtained from this research work can be adequately used for determining what obtains in the banking industry in Nigeria. The relevant information for the study was obtained from the headquarters of selected banks because the head of system department at the headquarters has access to key information on ICT devices and from published reports of the Nigerian stock exchange.

Method of Data Analysis

Dependent variables

In model 1: The dependent variable is Cost Efficiency. The two cost efficiency measures used are; operating cost rate and asset management rate are the dependent variable and are defined as follows:

(a) OCR = OE/TR

Where

OCR = Operating cost rate

OE = Operating expense

TR = Total revenue

The operating cost rate (OCR) measures the cost efficiency of a bank's operating activities, the higher the measure, the lower the cost efficiency of the operating activities.

(b) AMCR = OE/TA

Where

AMCR = Asset Management Cost Rate

OE = Operating expense

TA = Total Assets

The Asset Management rate (AMCR) measures the efficiency of asset management activities. Similar to the OCR, the higher the AMR measure, the lower the asset management efficiency for the sample banks

Independent Variables.

The main independent variable is the intensity of ATMs (IATMs) deplored by the banks.

Measure of IATMs:

The main reason for banks to invest in ATM is to reduce the operating costs of banks in general and labour cost in particular; thus we measure the extent a bank uses ATM relative to its labour utilization.

IATM = NATM/NE

Control Variables

Apart from IATMs that could impact on the cost efficiency of banks in Nigeria other factors such as bank size (BS), salary level (SL), nonperforming loan ratio (NPLR) can. These factors are adjusted for as control variables. This also in line with the work of Chin-S et al. (2008)

The control variables proposed are derived as follows:

BS = log (TA)

SL = PE/NE

NPLR = NPL/TL

Where

TA = Total Asset

BS = Bank size

SL = Salary size

NPLR = Nonperforming loan ratio

NPL = Non performing Loans

TL = Total Loans

PE = Personnel expenses

NE = Number of employees:

8. RESULTS AND DISCUSSIONS

In research, the main preoccupation is whether there is a relationship or whether two or more variables co-vary as multiple measures of co-variation or association exist. Multiple regressions was used in this study to parametise the relationship in the models.

In model 1; the cost to income ratio and asset management rate were used as the dependent variables to correlate with the intensity of ATM deployed by banks, nonperforming loans ratio, bank size and salary level as independent variables.

The model focuses on the effects of a unit increase in one independent variable on the dependent variable.

9. DATA PRESENTATION

The impact of ATM investment on Cost efficiency of banks in Nigeria

In order to achieve objectives of the study which is to empirically evaluate the effect of automated teller machines investment on the cost efficiency of banks in Nigeria a multivariate regression analysis was employed. The cost efficiency of the banks was operationalised using cost to income ratio and asset management rate as the measure of cost efficiency. These were regressed against the intensity of ATM deployed by banks while controlling for nonperforming loans ratio, bank size and salary level. This is in line with the work of Chin S et al., (2008). The result is as shown below in table 4.1.

Table 5: The impact ATM deployment on the cost to income ratio of banks in Nigeria.

Variables	Coefficient	t (value)	p (value)
Constant	35.40528	2.97	0.007
Number of ATM (natm)	0.0049675	1.32	0.089
Nonperforming loans ratio (nplr)	1.028953	1.19	0.198
Bank Size (bsize)	2.9767	1.57	0.184
Salary level (sallevel)	-0.0001916	-0.36	0.486

R2 = 0.4789 *** significant at p< 0.05

The multiple regression line is as written below:

ciratio = 35.40528 + 0.0049675natm + 1.028953nplr + 2.9767bsize – 0.0001916sallevel + ε

The adjusted R2 is 0.4789 which implies that 47.89 percent of the variation on cost to income ratio of banks is being explained by the four variables considered in the model. Three of the four variables are significant. These are: number of ATMs, nonperforming loans and bank size.

Specifically, the coefficient of number of ATMs is 0.0049675. It is positive and statistically significant at $p<0.05$. This shows a significant effect of IATMs on cost to income ratio of banks while the positive sign implies that a unit increase in IATMs will tend to 0.50 unit increase in cost to income ratio of banks. This may reflect the effect of the initial stage of ATM deployment given the huge sunk cost involved in ATM deployment which is likely going to affect the operating cost and of course the cost to income ratio of the banks. Perhaps over a longer time frame the result might be different. This in line with the works of Chin S et al., (2009) which in providing answers to the question 'can ATM investment improve Bank Cost Efficiency?' confirmed that the intensity of ATM deployment has positive effect on the cost efficiency of banks in Taiwan.

The coefficient of nonperforming loans is1.028953, It is positive and statistically significant at $p<0.05$. This shows a significant effect of nonperforming loans on cost to income ratio of banks while the positive sign implies that a unit increase in number of nonperforming loans will tend to 1.02 unit increase in cost to income ratio of banks. The result confirms that nonperforming loans have a negative effect on operating efficiency of banks. The reason for controlling problem loans is that it is regarded as an exogenous influence coming from external unfortunate events (Berger and Humphrey (1997). Banks need to pay more attention to processing, monitoring, and managing nonperforming loans than performing loans. If a bank's nonperforming loan ratio is higher than that of other banks, its loan quality may also be affected. According to Girandone et al.., (2004), the nonperforming loan ratio is usually positively related to bank inefficiency with regard to the coefficient for the level of NPLs.

The coefficients of bank size is 2.9767 is positive and significant at $p<0.05$. The implication of this is that a unit increase in the bank size will tend to 3.68 unit increase in the cost to income ratio of banks. This is, however, at variance with prediction as in the work of Chin S et al., (2009), based on the theory of economic of scale which suggest that larger banks usually have cost advantages over small ones.

The coefficient of salary level is -0.0001916 negative and not significant at $p<0.05$. This implies that a unit increase in salary level tends to no change in cost to income ratio of banks. The result shows that salary level do not significantly affect the cost income ratio and by extension the cost efficiency of banks.

The hypothesis which states that ATMs deployments do not have significant effect on the operating cost rate of Nigerian banks is hereby rejected and consequently, ATMs deployments do have significant effect on the operating cost rate of Nigerian banks.

Table 6 : The impact ATM deployment on the asset management rate of banks in Nigeria.

Variables	Coefficient	t (value)	p (value)
Constant	67.06948	0.44	0.669
Number of ATM (natm)	0.0329212	1.01	0.336
Nonperforming loans ratio (nplr)	-14.49511	-1.45	0.179
Bank Size (bsize)	-11.94336	-0.42	0.687
Salary level (sallevel)	0.0002337	0.22	0.831

R2 = 0.3775 *** significant at $p< 0.05$

The multiple regression line is as written below:

amratio = 67.06948 +0.0329212natm -14.49511nplr -11.94336bsize + 0.0002337sallevel + ε

The adjusted R2 is 0.3775 which implies that 37.75 percent of the variation on asset management rate of banks in Nigeria is being explained by the four variables considered in the model. The higher the asset management cost rate measure, the lower the asset management efficiency for the sample banks.

Three of the four variables are significant. These are: number of ATMs, nonperforming loans and bank size.

Specifically, the coefficient of IATMs is 0.0329212. It is positive and statistically significant at $p<0.05$. This shows a significant effect of number of ATMs on asset management ratio of banks while the positive sign implies that a unit increase IATMs will tend to 3.3 unit increase in asset management ratio of banks. This provides an indication that banks have not been able to leverage on ATMs deployment to achieve good asset management efficiency. This is contrary to the empirical results in the work of Chin S et al., (2009), which confirm that ATM intensity has positive effect on the cost efficiency of banks.

The coefficient of nonperforming loans is -14.49511. It is negative and statistically significant at $p<0.05$. This shows a significant effect of nonperforming loans on asset management ratio of banks while the negative sign implies that a unit increase in number of nonperforming loans will tend to 14.49 unit decrease in asset management ratio of banks. The result is at variance with prediction that nonperforming loans have a negative effect on operating efficiency of banks. The reason for controlling problem loans is that it is regarded as an exogenous influence coming from external unfortunate events (Berger and Humphrey (1997). Banks need to pay more attention to processing, monitoring, and managing nonperforming loans than performing loans. If a bank's nonperforming loan ratio is higher than that of other banks, its loan quality may also be affected. According to Girandone et al.., (2004), the nonperforming loan ratio is usually positively related to bank inefficiency with regard to the coefficient for the level of NPLs.

The coefficients of bank size is -11.94336 is negative and significant at $p<0.05$. The implication of this is that a unit increase in the bank size will tend to 11.94 unit decrease in the asset management ratio of banks. This is in line with prediction as in the work of Chin S et al., (2009), that as larger banks usually have huge capital; therefore large banks often make well-arranged asset management plans. We can say therefore that bank size has a positive effect on bank asset management efficiency.

The coefficient of salary level is 0.0002337 positive and not significant at $p<0.05$. This implies that a unit increase in salary level tends to almost no change in asset management ratio of banks. The result shows that salary level do not significantly affect the asset management ratio and by extension the asset management efficiency of banks.

The hypothesis which states that ATMs deployments do not have significant effect on the asset management rate of Nigerian banks is hereby rejected and consequently, ATMs deployment have significant effect on the asset management rate of Nigerian banks. This implies that ATMs investment have significant effect on the cost efficiency of Nigerian banks

10. SUMMARY, CONCLUSION AND RECOMMENDATIONS.

Findings from the impact ATM deployment on the cost to income ratio of banks in Nigeria showed that apart from number of ATMs which made positive contribution to cost to income ratio, nonperforming loans and bank size were also significant in contributing. However, given the relatively low R2 = 0.4789, other factors outside the variables used in the model also contribute to the cost income ratio of banks in Nigeria. The implication of this is that banks should look beyond ATMs deployment for improvement in cost efficiency.

Also, the findings from the impact ATM deployment on the asset management rate of banks in Nigeria showed that apart from number of ATMs which made positive contribution to asset management rate, salary level was also significant in contributing. Again given the relatively low R2 =0.3775, other factors outside the variables used in the model also contribute to the cost income ratio of banks in Nigeria. The implication of this is that banks should look beyond ATMs deployment for improvement in cost efficiency.

11. CONCLUSIONS AND RECOMMENDATIONS

The study showed that the deployment of ATMs contributed to banks cost efficiency measured in terms of cost to income ratio and asset management rate. While it was positive, other factors such as nonperforming loans and bank size as well salary level were found to have contributed.. It was also revealed from the study that given the relatively low coefficient, other factors outside the model contributed to the cost efficiency of banks.

As a result of the above findings and conclusions, the following recommendations were made:-

Banks in Nigeria should continue to deploy ATMs as a strategic tool for improved cost efficiency

Banks need however to also focus on other areas of IT for cost efficiency improvement

Banks should strengthen their management of nonperforming loan and manage their size in their effort to improve cost efficiency.

12. CONTRIBUTION TO KNOWLEDGE

The results of the study has provided useful information on the effect of ATM deployment on cost efficiency of banks. It has also provided information that should refocus the banks in their quest for improved cost efficiency demanding looking beyond ATMs investment..

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