

# INFORMATION AND COMMUNICATION TECHNOLOGY AND BANK PERFORMANCE IN NIGERIA: A PANEL DATA ANALYSIS

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## ABSTRACT

This study examines the impact of Information and Communication Technology (ICT) on the bank's performance in Nigeria using annual panel data set over 2001 to 2011 periods. The data was analysed using panel unit root, panel cointegration, Fully Modified Ordinary Least Square (FMOLS) and Generalised Method of Moments (GMM) to reveal a positive impact of ICT on the bank's performance in the country. Therefore, the study concludes that cautious application of ICT apparatus will continue to enhance commercial bank's performance in the country unless otherwise disrupted by externalities.

**Keywords:** Bank, Panel Data, Information and Communication Technology.

**JEL Classifications:** G210, C22, Z19.

## ÖZET

### *NİJERYA'DA ENFORMASYON VE İLETİŞİM TEKNOLOJİSİNİN BANKA PERFORMANSI ÜZERİNDEKİ ETKİLERİ: BİR PANEL DATA ANALİZİ*

Bu çalışma, Enformasyon ve İletişim Teknolojisinin (ICT) Nijerya'da bankaların performansı üzerindeki etkilerini 2001-2011 dönemine ait yıllık panel data setlerini kullanarak incelemektedir. Veriler panel birim kök ve eşbütünleşme, Tam Modifiye Edilmiş En Küçük Kareler ve Genelleştirilmiş Momentler yöntemleri ile analiz edilmiştir. Analiz sonuçları, ele alınan ülkede ICT'nin banka performansını olumlu etkilediğini göstermektedir. Dolayısıyla bu çalışma dışsalılıklarla kesintiye uğramadıkça ICT aparatlarının dikkatli bir şekilde uygulanmasının ticari bankaların performanslarını güçlendireceği sonucuna varmaktadır.

**Anahtar Kelimeler:** Banka, Panel Data, Enformasyon ve İletişim Teknolojisi.

**JEL Kodları:** G210, C22, Z19.

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## I. Introduction

It is widely recognised that the financial system plays a crucial role in promoting economic development by separating the saving and investment functions. Virtually, investment in all sectors of the economy, particularly the real sector, made possible by the financial resources in the financial system, could increase the quantum of goods and services (Ibrahim, Muhammad and Gani, 2012). Banking institution which is a major player of the financial system is an important economic agent in the payment system. Accordingly, bank facilitates economic transaction between various national and international economic units and by so doing, it encourages trade, commerce and industry on the one hand, promoting globalization by easing global access to fund without any barrier.

It is needless to say that, the banking system is able to play the positive role of enhancing globalization only if it has robust Information and Communication Technology (ICT) as a backstopped. Otherwise, it would constitute bad omen to the development of the global economy. This is based on academics unanimity of impossibility of globalisation without global agents of payments. The increased demand for ICT in banking sector became imminent and unavoidable in the world at large and Nigeria in particular. Invariably, the future lies in the ICT driven banking systems and services. Banks have embarked on an unprecedented deployment of ICT based banking products and services such as Automated Teller Machine (ATM), internet banking, mobile banking solutions, point of sale terminals, computerised financial accounting and reporting, human resources solution among others, of which plays salient roles in enhancing the performance of banks over the world (Ovia, 2005).

Eventually, the ICT became the lifeblood of any corporate organisation for growth and development, thereby making the entire world moving away from traditional banking to computerised banking applications. Consequently, there has been huge investment in ICT facilities and personnel with requisite skills necessary for the operation of ICT born devices. Banks have faced the stiff challenges of required hefty fund for investments in human capital, capacity building, deployment of equipments, designing applications, and so on due to the ever rapidly changing in ICT devices as a result of breakthrough on the one hand and the dynamism of the global ICT industry on the other hand (Abubakar, Gatawa and Birnin-kebbi, 2013). Over the years, banks have invested huge capital in the deployment of ICT solutions for front office and back office automation alike. However the ever-increasing challenges of ICT deployment in conformity with the banking best-practice had

remained a burning issue in the banking industry and so need to investigate its relevance on a bank's performance becomes imperative. It is against this background that this study sets to investigate the role of ICT in bank performance in Nigeria. To achieve the thrust of this study, five sections were developed, including this introduction which is section one. Section two reviews literature. Section is the methodology of the study. Section presents and discusses the results and the last section concludes the study.

## II. Literature Review

Like any other social scientific problem, the findings from preceding studies on the impact of ICT on the banking sector in both developed and Less Developed Countries (LDCs) produces divergence results. For instance, Dos Santos and Peffers (1993) empirically studied the effects of early adoption of ATM device 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 device improves the bank's performance. By extension, Beccalli (2005) investigated whether investment in Information Technology (IT) influences the performance of banking, using a sample of 737 European banks over the period 1994–2000. Using simple correlation coefficients, the findings revealed a negative and statistically significant correlation between profit efficiency and IT.

Evans, (2008) investigates the role of ICT on enhancing the operations of Nigerian banks using primary data which was analysed with cross-tabulations and regression technique to reveal a significant positive impact of ICT on banking operations. Lin (2007) studied the impact of ICT on United State banking industry using a cross-sectional data of 155 banking firms for the period 1995 to 1999 by employing multiple linear regression models. The results of the study indicated that ICT contribute to the overall value-creation performance of banking firms. Moreover, Alawneh and Hattab (2009) assessed the value of e-business at the bank level in Jordan using a survey data collected from 140 employees in seven pioneered banks. The study utilised multiple linear regression analysis, the empirical findings showed that e-banking was found to have a significant positive influence on bank performance.

Furthermore, Muhammad and Muhammad (2010) examined the impact of ICT on organizational performance using primary data collected through in-depth interviews and field surveys of 48 manufacturing and 24 banking industry in Pakistan over the period 1994 to 2005. The data were tested using multiple linear

regression model and ratio analysis. The conclusion of the research shows that ICT has a positive impact on organizational performance of all sampled organisations. In a study by Akram and Hamdan (2010) examined the effects of ICT on Jordanian banking industry for the period of 2003–2007. The data were analysed by multiple regression model and 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), Earning Per Share (EPS), Return on Assets (ROA) and Net Profit Margin (NPM). Similarly, Ombati, Magutu, Nyamwange and Nyaoga (2010) studied the relationship between technology and service quality in the banking industry in Kenya using primary data drawn from a sample of 120 customers utilising e-banking services within the Central Business District, Nairobi. The authors used both descriptive and inferential statistics such as correlation analysis, percentages and means to analyse the data. The findings of the study indicated a direct relationship between ICT and service quality in the banking industry.

ICT led bank performance hypothesis was tested in the study by Agbolade (2011). The study used primary data sourced through a structured questionnaire administered to selected banks in south-west Nigeria and the Ordinary Least Square approach econometric techniques was applied to detect the relationship that exist between banks' profitability and the adoption of ICT. The results showed that a positive correlation exists between ICT and bank's profitability in Nigeria. Similarly, Uppal (2011) examined the growth of ICT in various bank groups in India using data collected over the period 2008–2009. The findings revealed that the growth of ICT led to the high bank performance. Conversely, Abubakar *et al.*, (2013) study the impact of ICT on the bank's performance in Nigeria in 2001-2011 period. The study employed fixed and random effects to reveals the negative impact of ICT on the bank's performance.

### **III. Methodology**

In this study, secondary data in the form of panels have been used. The data were collected from the bank's annual financial reports and various issues of Factbooks from Nigerian Stock Exchange covering the period 2001–2011. The data for relevant variables comprises net profits, Return on Equity (ROE), number of ATM devices and volume of transaction on e-banking services of the selected commercial banks.

We first used the panel unit root tests to identify the order of integration of each variable incorporated in the study. Basically, there are four different most

widely used panel unit root tests in several studies and they are Levin, Lin and Chu (2002,) which will be referred to as an LLC, Im, Pesaran and Shin (henceforth IPS), (2003) and Fisher-type tests using ADF and PP tests of Maddala and Wu (1999) and Choi (2001). Given that each variable is integrated of order one, the tests suggested by Pedroni (1999, 2000) were employed for panel cointegration in this study. These tests extend the Engle and Granger (1987) two-step strategy to panels and rely on the ADF and PP principles.

Basically, once cointegration has been established among the relevant variables, a model could be estimated utilizing the (FMOLS) technique. According to Pedroni (2000), standard OLS estimation of a panel will lead to an asymptotically biased estimator because the estimates will be dependent on the nuisance parameters that are associated with the dynamics of the underlying system. He argues that only in the case of exogeneity of the regressors and homogenous dynamics across the individual members of the panel, is it possible for the OLS estimator to be unbiased (Ramirez and Sharma, 2008). The superiority of FMOLS estimator lends credence by its ability to account for both serial correlation and potential endogeneity problems, and hence is preferable to simple OLS estimation in case cointegration relation exists among the variables. One of the advantages of using FMOLS techniques is that it allows for the panel-specific fixed effects to be heterogeneous while estimating the long-run relationships (Pedroni, 2000). The FMOLS used in this study is specified below:

$$\text{netprofit} = \alpha_{it} + \beta \text{ROE}_{it} + \beta \text{E-banking}_{it} + \beta \text{ATM}_{it} + \mu_{it} \dots \dots \dots (1)$$

Where

netprofit	=	net profit (a proxy for bank performance)
$\alpha_i$	=	allows for the bank-specific fixed effects
$\beta$	=	cointegrating vector if a variable is integrated of order 1
ROE	=	Return on Equity
ATM	=	ATM usability
E-banking	=	e-banking services
$\mu$	=	Error term

The time and the number of panels employed in this study satisfied the necessary condition for the application of FMOLS. According to Pedroni (2000) FMOLS estimator is consistent and can perform reasonably well, even in small samples as long as the time period under consideration is not smaller than the

number of cross sections.

This study further uses Generalized Method of Moments (GMM) for panel data analyses, proposed by Arellano and Bond (1991) to detect the contemporaneous effect of ICT on bank performance in Nigeria. The technique is specified below:

$$s_{it} = \phi s_{i,t-1} + \lambda x_{i,t} + \eta_i + \varepsilon_{it} \dots \dots \dots (2)$$

Where  $S$  is the proxy for bank's performance (net profit),  $X$  represents the vector of explanatory variables,  $\eta_i + \varepsilon_{it}$  denotes unobserved group-level effect and the error term, respectively. Moreover, they based on the assumption of being independent for each  $i$  over all  $t$ , and that there is no autocorrelation in the  $\varepsilon_{it}$ . The specification above exhibit evidence of endogeneity since  $S_{it}$  is correlated with  $\eta_i$  which may lead to inconsistent and biased estimators. To ameliorate endogeneity problem from the group-specific effects, we resort to difference of the above equation.

$$s_{it} - s_{i,t-1} = \phi(s_{i,t-1} - s_{i,t-2}) + \lambda(x_{i,t} - x_{i,t-1}) + (\varepsilon_{it} - \varepsilon_{i,t-1}) \dots \dots \dots (3)$$

Even though the difference operator eliminates the group-specific effects, but it does at the expense of re-introducing a new correlation between  $S_{i,t-1}$  (lagged dependent variable) and  $\varepsilon_{i,t-1}$ . To eradicate these problems, instrumental variables must be set. Adusei (2013) argued that the lagged explanatory variables can be used as instrumental variables. To these ends, we utilized lagged explanatory variable instrumental variables.

#### IV. Results and Discussion

The results of the LLC, IPS, Fisher-ADF and Fisher-PP panel unit root for each of the variable is reported in the Table 1 and from it one could observe that all of the variables exhibit unit roots at level form under 1% probability level. However, ROE is stationary at level under 10% level of significance.

**Table 1: Panel Unit Root Test Results**

Series	Level				1 <sup>st</sup> Difference			
	LLC	IPS	ADF Fisher	PP Fisher	LLC	IPS	ADF Fisher	PP Fisher
ROE	-1.769 (0.038)*	-0.469 (0.319)	2.504 (0.286)	5.526 (0.063)*	-3.426 (0.000)**	-1.626 (0.0519)*	6.998 (0.030)**	11.73 (0.002)***
Net Profit	-1.08 (0.140)	0.161 (0.564)	1.132 (0.568)	1.132 (0.568)	-5.21 (0.000)**	-2.89 (0.000)**	10.50 (0.000)***	20.60 (0.000)***
E-banking	-324 (0.374)	0.487 (0.687)	0.690 (0.708)	0.670 (0.716)	-2.482 (0.006)**	0.301 (0.381)	2.900 (0.234)	3.460 (0.179)
ATM	-0.771 (0.220)	-5.588 (0.278)	2.821 (0.244)	3.00 (0.223)	-2.591 (0.004)**	-1.345 (0.089)*	5.530 (0.630)	8.363 (0.015)**

\*\*\* \*\*& \* denote statistical significance at the 1% , 5% and 10% level respectively

The first difference value of the each variable in the panel root test reveals that the variable were stationary leading to the rejection of the null hypothesis at the 1% level of significance. Therefore, we gain ground to assert that the variables were I(1) order and thereby lending credence for the application of the Pedroni panel cointegration test.

**Table 2: Pedroni Panel Cointegration Test Results**

Panel	Panel Statistics		Group	Group Statistics	
	Statistics	Probability		Statistics	Probability
v-statistics	3.051	0.001***	rho-statistics	2.299	0.989
rho-statistics	0.751	0.774	PP-statistics	-17.071	0.000***
PP-statistics	-14.457	0.000***	ADF-statistics	-2.36	0.009***
ADF-statistics	-2.744	0.003***	-	-	-

\*\*\* denote statistical significance at the 1%

It could be seen from the Table 2 the coefficients of panel statistics for v, panel PP, and group PP statistics and group ADF were significant at the 1% level of significance. As such the null hypothesis proposing no cointegration relation among the variables is rejected in all cases for panel v, panel PP, and group PP as well as group ADF statistics except panel  $\rho$  and group  $\rho$  whom were not statistically significant. Therefore, the panel cointegration tests point to the existence of a long-

run relationship among the variables, under which FMOLS is a Best Linear Unbiased Estimator (BLUE).

**Table 3: Panel FMOLS Results**

Variable	Coefficient	Probability
ROE	7.27	0.7003
E-banking	7.27	0.1079*
ATM	7.80	0.0275**
R <sup>2</sup>		0.76
Long-run variance		3.53
Hansen parameter instability test		LC statistics 0.469 (0.2)

\*\*& \* denote statistical significance at the 5% and 10% level respectively

It could be seen from the above Table 3, the long-run coefficient of E-banking is positive and statistically significant at 10% probability level. The positive sign of the parameter is showing the prospect of E-banking in Nigeria and there is a possibility of the Nigerian economy to imbibe the culture of a cashless society. Moreover, the coefficient of ATM is also positive and statistically significant at 5% probability level, which is showing the strength of ATM on enhancing bank's performance in the country. On the other hand, the estimated coefficient of ROE is positive but not significant.

**Table 4: Panel GMM**

Variable	Coefficient	Probability
ROE	-20.23	0.0413**
E-banking	94.71	0.0873*
ATM	90.16	0.0015***
R <sup>2</sup>		0.73
j-statistics		2.115 (0.1459)*
Instrument rank		4

\*\*\* \*\*& \* denote statistical significance at the 1% , 5% and 10% level respectively

Further post-estimation tests reveals that the equation has a good fit. For instance the R<sup>2</sup> value is 0.76 indicating that 76% variation of the bank performance is jointly account by ICT and ROE. The Hansen parameter instability test was also applied in the study and the test has a null hypothesis claiming that parameters are stable. The result of this test cannot show any evidence of rejecting the null hypothesis, since the LC statistics is not significant even at the 10% level of significance and so parameters stability has been confirmed.

The result of GMM is presented in Table 4. It could be discerned from it that the coefficients of the ICT proxies (E-banking and ATM) were positive and statistically significant. This finding is in accord with the theoretical postulation of Ovia, (2005) and the empirical findings of Evans, (2011) and that of Agbolade, (2011) which hold that positive correlation exist between ICT and Banks performance. However, the finding refutes the revelations of Lin (2007) and Abubakar *et al.*, (2013). Moreover, the study further finds that ROE is statistically significant and the negative sign of the coefficient indicates a negative relationship between ROE and bank performance in Nigeria. This finding means that ROE has a tendency of affecting bank's performance adversely. When banks are making huge amount of profit, its share price (both primary and secondary issues) will rise as a result of increase in its demand. More shareholders imply more payments of dividend and thereby reducing the ploughing back of profit for investment motive, as such performance of banks will be adversely affected.

## V. Conclusion

This study examines the impact ICT on the bank's performance in Nigeria using a panel data set sourced from the NSE Factbook of various issues. The data was analysed using FMOLS and GMM among others, to reveals that ICT do improve banks performance in the country. Surprisingly, it has been established in this study that ROE has a significant negative influence on bank performance in the short-run while its impact on the bank's performance was positive but insignificant in the long-run. Therefore, the study concludes that cautious application of ICT apparatus will continue to improve commercial bank's performance in Nigeria. The policy implication of this finding is pointing out the potentiality of a cashless economy in Nigeria. Therefore, CBN cashless policy is a sound initiative in the right direction since it will help in minimising the cost of issuing currency in the fairly performing Nigerian economy. Emphasis should be given on the efficient utilisation of the ICT equipment such as credit, Points of Sales (POS), phone banking, electronic payment debit, cash withdrawal machines, to mention but few. However, for banks and populace alike to actually reap the benefit of ICT more campaigns and orientation of clients need to be vigorously pursued to create awareness for them to patronise the facilities. It is worthy noting, the success of this policy will depend on the level of financial literacy and degree of poverty in the country.

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