

## Internet Banking and Financial Intermediation in the Nigerian Banking Industry

<sup>1</sup>Akintunde Olawande Ayeni, <sup>2</sup>Oloruntoba Adeyemi David & <sup>3</sup>Arandong Idi Jamok

<sup>1&2</sup>Department of Banking and Finance, University of Jos

<sup>3</sup>Department of Business Administration, University of Jos

Article DOI: 10.48028/iiprds/ijormsse.v8.i1.04

---

### Abstract

---

The acceptance and deployment of internet banking service is expected to improve financial intermediation banking system by reducing cost of transactions, enhancing liquidity and increased financial intermediation. However, this is a far cry to what is being experienced in the Nigerian banking industry, as credit flow from banks have been on the decline. It has been revealed that the total credit from banks to the economy recorded a decline of #135.8bn from #15.74tn at the end of the fourth quarter of last year to #15.6tn in the first three months of 2020. These revelations suggest that Nigeria's economic growth trajectory has been diminutive, as individuals have found it difficult to have access for either start-up or expansion of their businesses from banks. On this premise, this study was carried out to investigate the effect of internet banking on financial intermediation. In a clear departure from existing literature, the study factored in the moderating effects of interest rate and cash reserve ratio, which hitherto has been identified as key impediments to bank intermediation. Data was collected from 2009 to 2020 on monthly bases from the Central Bank of Nigeria (CBN) for the variables; financial intermediation (measured as ratio of currency outside banks to broad money supply), interest rate, cash reserve ratio and internet banking service for all commercial banks in Nigeria. Linear Regression models were formulated to achieve the stated objectives. Findings revealed that internet banking service has a negative insignificant effect on financial intermediation, the interaction between internet banking and interest rate has a positive insignificant effect on financial intermediation while the interaction between internet banking and cash reserve ratio has a negative insignificant effect on financial intermediation. It was recommended among others that the Central bank of Nigeria should make efforts to alleviate the cost of internet banking borne by banks. This will certainly reduce the burden on banks and make more money available for intermediation.

**Keywords:** *Internet Banking, Financial Intermediation, Nigerian Banking Industry*

---

Corresponding Author: Akintunde Olawande Ayeni

<http://internationalpolicybrief.org/journals/international-scientific-research-consortium-journals/intl-jrnl-of-operational-research-in-mgmt-soc-sci-edu-vol8-no1-february-2022>

### **Background to the Study**

Electronic banking (E-banking) refers to the acceptance of information and communication technology in the banking sector. The application of its concepts, techniques, policies, and implementation strategies to banking services has become a subject of fundamental importance and concern to all banks and indeed a pre-requisite for local and global competitiveness. This is because it directly affects management decisions, plan and products as well as services to be offered by banks (Okoro, 2013). One major component of electronic banking is internet banking.

Internet banking has become a marvel to the world especially the developing nations (Nigeria inclusive). The era of carrying large sums of cash and perhaps stay endlessly in the banking halls in order to pay or get paid is becoming a thing of the past (Adewuyi, 2011). Internet banking has curtailed this gap by offering speed, efficiency, comfort and security to banking procedures. Thus, the role of this form of banking cannot be undermined in the banking business.

Several authorities believe that the adoption of internet banking will help to improve the efficiency of the financial system by reducing cost of transactions, enhancing liquidity, facilitating better allocation of financial resources that can bring significant benefits to all parties in the financial sector and increase financial intermediation (Ekwueme, Egbunike and Amara, 2012; Okoro, 2013; Abubakar, 2014). Financial intermediation refers to the process performed by banks of taking in funds from a depositor and lending them out to a borrower (Kamau, 2011). Sufian and Chong (2008) sees financial intermediation as a productive activity in which an institutional unit incurs liabilities on its own account for the purpose of acquiring financial assets by engaging in financial transactions on the market. The economic literature pays a great deal of attention to the performance of banks, expressed in terms of intermediation efficiency, productivity and profitability (Bikker and Bos, 2008). The key reason is that banks are seen as special, given their pivotal role in providing credit to enterprises. Nevertheless, this key responsibility can be vulnerable when key initiatives or policies are introduced.

On this premise, it would appear that the introduction of internet banking has the potential of determining the amount of deposits in banks for intermediation purposes. Several researches carried out in this area have provided mixed evidences. Aduda and Kingoo (2012), argued that while the speedy growth of information technology has made some banking responsibilities more efficient and cheaper, such technological investments are also taking a larger share of banks' resources. Ali and Emenike (2016), also stressed that the importance of internet banking in the development of the banking industry is undeniable. However, they found lack of proportionality between the increase in the scale of technology utilization and banks efficiency. It was also found that despite the increased popularity of electronic payment systems and increase in the total volume of transaction, its effect on several indices of the economy cannot be ascertained (Durgun and Timur, 2015).

In contrast, Akinlo (2007), found that internet banking has positively and significantly improved the performance of banks in Nigeria, and in effect enhanced their intermediation capabilities. It has also been found that apart from the suitability and safety of internet banking, it also offers a significant number of economic benefits which include mobilizing savings and ensuring most of the cash available in the country, which hitherto have been in possession of customers, are with banks (Okoro, 2013). This opinion is further buttressed by scholars (Al-Laham, Al-Tarawneh and Abdallat, 2009; Abubakar, Shagari and Olusegun, 2015) who documented that as the transition to internet banking takes place, the stock of currency held outside the banking system, which constitutes a potential source of unproductive economic resource, is integrated into it thereby expanding the deposit base of the money system.

It has also been acknowledged that payment innovations have the potential to challenge the predominant role of cash for making small value payments and could make retail transactions easier and cheaper for consumers and merchants (Ibenta and Anyanwu, 2017) This can possibly make funds available to borrowers, especially businesses and individuals. Popovska-Kamnar (2014)'s opinion is quite different as he found that the impact of electronic banking on several indices in the economy would be majorly evident in developed countries and very minimal or non-existent in developing countries such as Nigeria.

Apparently, there seems to be divided opinions on whether internet banking will affect banks' intermediation efficiency and this study stands to shed light on this area of study. Consequently, an empirical investigation on the influence of electronic banking on banks' intermediation efficiency is utmost for academic and policy formulation purposes. This study also considers the mediating role of some associated determinants such as interest rate and cash reserve ratio as observed by Malade (2014), who argued that these are the two major factors that affect bank lending.

### **Problem Statement**

Efficient intermediation is crucial because it facilitates transactions and makes credit and other financial products available for businesses. It serves as a “building block” for private/public sector development, economic growth and poverty reduction. Without efficient intermediation, these cannot be achieved, especially in developing economies.

Contrastingly, the situation in Nigeria suggests a precarious scenario. The Central Bank of Nigeria notes that the flow of credit to the private sector did not meet the prescribed targets and failed to impact positively on investment, output and domestic price level (CBN, 2018). In addition, Business News (2016) reports that banking sector credit (net) to the Government have been on a decline and private sector credit has been fluctuating. Credit by banks has been shaky and as a consequence, affected businesses that require short-term and long-term funds. This has reduced investment in the country as investors find it discouraging to borrow from banks. A disheartening report by Enejeta (2018), revealed the total credit from banks to the economy recorded a decline of N135.8bn from N15.74tn at the end of the fourth quarter of last year to N15.6tn in the first three months of

2020. These revelations suggest that Nigeria's economic growth trajectory has been hampered, as individuals find it difficult to have access for either start-up or expansion of their businesses. Lack of adequate credit for individuals and businesses in an economy leads to demise of businesses, unemployment and ultimately, underdevelopment.

These insights evoke certain questions bothering on the intermediation capacity of banks in the Nigerian economy. Several factors have been identified in literature as impediments to banks' ability to efficiently channel credit (Oni, 2010; Berger and Bouwman, 2009; Olokoyo, 2011 and Malade, 2014). Common factors acknowledged in these studies include interest rate and cash reserve ratio. High reserve requirements impose additional costs on banks, since they have to pay a market interest rate to depositors and still hold a fraction of these deposits in the Central Bank. High interest rate also affects borrowers because it reduces the capacity of borrowers to seek loans and advances. These developments provoke the need to carry out an empirical investigation to ascertain the effect of internet banking on intermediation efficiency in the Nigerian banking industry.

### **Research Questions**

Based on these contentious issues raised in the problem statement, the following questions were formulated to provide focus and direction for the research.

- i. What is the effect of internet banking on financial intermediation in the Nigerian banking industry?
- ii. What effect does the interaction between internet banking and interest rate have on financial intermediation?
- iii. What effect does the interaction between internet banking and cash reserve ratio have on financial intermediation?

### **Research Hypotheses**

Based on the aforementioned research questions, the following hypotheses are hereby advanced:

- Ho1:** Internet banking has no significant effect on financial intermediation in the Nigerian banking industry.
- Ho2:** The interaction between internet banking and interest rate has no significant effect on financial intermediation in the Nigerian banking industry.
- Ho3:** The interaction between internet banking and cash reserve ratio has no significant effect on financial intermediation in the Nigerian banking industry.

### **Literature Review**

#### **Internet Banking**

This refers to a medium of payment system where customers' instructions are taken and attended to through the internet. It is believed that internet banking offers customers the prospect of enjoying banking services from the comfort of their homes and offices (Abanaewe et al., 2013). This implies that customers can buy goods by placing orders from the net, instruct their banks to pay vendors the invoice amount involved, and the products are delivered to the destination where the buyer wants. Furst, Lang and Nolle

(2002), sees internet banking as the use of internet as a remote delivery channel for banking services. Such services include traditional ones, such as opening a deposit account or transferring funds among different accounts, and new banking services, such as electronic bill presentment and payment (allowing customers to receive and pay bills on a bank's Web site). Takyi and Poku (2015), further maintained that internet banking involves the use of technology to communicate instructions to and receive information from a financial institution where an account is held. This medium of payment includes the systems that enable financial institution customers, individuals or businesses to access accounts transact business or obtain information on financial products and services through a public or private network including the internet.

The internet is a technology that spreads quicker than any other technology and the use of internet is estimated to double in every hundred days. Since the new millennium, internet banking has experienced explosive growth in many countries and has transformed traditional banking practice (Aladwani, 2001). By offering internet banking services, traditional financial institutions seek to lower operational costs, improve consumer-banking services, retain consumers and expand share of customer. The extent of services offered by an Internet bank depends largely on its size. A 1999 study of internet banks by the U.S Office of the Comptroller of the Currency showed that while most internet banks allowed services like balance inquiries, fund transfers between accounts and bill payments, larger banks are much more likely to have online brokerage, fiduciary and insurance services business lines (Furst, Lang and Nolle, 2002).

### **Financial Intermediation**

Intermediation refers to efficient allocation of resources to productive units in the economy (Kamau, 2011). Financial intermediaries channel funds from people who have extra money or surplus savings (savers) to those who do not have enough money to carry out a desired activity. There is sufficient evidence to show that countries that have relished or are relishing economic prosperity have been linked with an efficient mechanism for mobilising financial resources and allocating same for productive investment (Sanusi, 2002; Nzotta, 2004; Kamau, 2011, Ehimare, 2013). Efficient financial intermediation contributes to higher levels of output, employment, and income which invariably enhances the living standards of the population. The banking sector remains at the centre of this process, even in economies with less developed financial markets. Banks provide important positive externalities as mobilisers of savings, allocators of resources, and providers of liquidity and payment services, as well as a fulcrum for monetary policy implementation. Nzotta (2004), postulated that the banking sector is the dominant sector in the Nigeria financial service industry. He also described it as the most vibrant and component because whatever difficulties it passes through affects the entire economy greatly. The soundness of intermediation is as important as its volume, hence the need to have an efficient banking system. Banking sector efficiency is important for promoting access to financial services as well as stability of the banking sector as integral component of the financial system. Banks play essential role in the proper functioning of payments systems and their efficiency is directly related to improved productivity in the economy (Ikhide, 2009).

In literature, financial intermediation can be measured by the ratio of currency outside banks to broad money supply (Okereke, 2009; Okoro, 2013; Al-Jarrah, Al-Zu'bi, Jaara and Alshurideh, 2012; Nzotta and Okereke, 2009; Ewubare and Tuaneh, 2016). Broad money encapsulates the total volume of money supply in the economy and is defined as narrow money plus savings and time deposits with banks including foreign denominated deposits. Currency outside banks are monies that are physically used to conduct transactions between consumers and businesses rather than stored in a bank, financial institution or central bank. Currency in circulation is part of the overall money supply, with a larger portion of the overall supply being stored in current and savings accounts. In this regard, the ratio of currency outside banks to broad money supply accurately depicts the volume of money outside banks for intermediation purposes.

### **Effect of Interest Rate and Cash Reserve Ratio on Financial Intermediation**

The role of the Central Bank in a country is an important determinant of the ability of commercial banks to intermediate. Berger and Bouwman (2009), reported that level of the reserve requirement ratio set by the Central Bank influences the ability of banks to create credit. A high reserve requirement ratio reduces the amount of cash available for banks to create credit. The Central bank has the lender of last resort role. As the Central bank controls the supply of cash through various weapons of credit control such as bank rate, open market operations and variation of cash reserves, the upper limit of the volume of bank deposits is absolutely determined. Thus, the Central bank can control the creation of credit by increasing or reducing the total supply of cash in the economy. Several studies have found cash reserve ratio to have a significant influence on bank performance (Punita and Somaiya, 2006; Ajayi and Atanda, 1992; Abdulrahman, 2010). Nevertheless, other authors such as Ndugbu and Okere (2015) found no significant relationship between CRR and banks' performance.

Interest rate in an economy also has important implications for the growth and development, as several authors suggest a critical link between the efficiency of banks' intermediation and interest rate (Malade, 2014; Oni and Ozemhoka, 2013; Berger and Bouwman, 2009; Olokoyo, 2011). Corb (2012) argued that more efficient banking system benefits the real economy by allowing higher expected returns for savers with a financial surplus, and lower borrowing costs for investing in new projects that need external finance. An increase in the inefficiency of banks increases these intermediation costs, and thereby increases the fraction of savings that is lost in the process of intermediation. This ultimately reduces lending, investment and economic growth.

### **Internet Banking and Financial Intermediation in Nigeria**

The Nigerian banking sector has seen several changes since the beginning of e-banking. Today, customers of banks have efficient, fast and convenient banking services. In addition to rendering quality and acceptable services, most banks in Nigeria are investing large sum of money in information and communication technology. Aduda and Kingoo (2012), argued that while the speedy growth of information technology has made some banking responsibilities more efficient and cheaper, technological investments are taking

a larger share of banks' resources. Currently, apart from personnel costs, technology is usually the biggest item in the budget of a bank, and the fastest growing one. Banks need to manage costs and risks associated with electronic banking. As a result of these investments, the ability of banks to effectively channel their resources to productive sectors of the economy might be affected. In contrast, Akinlo (2010), argued that e-banking has positively and significantly improved the return on equity and profitability of banks in Nigeria, and in effect enhancing their ability to channel credit to the economy.

Electronic banking in Nigeria has emerged as a strategic resource for achieving higher efficiency, control of operations and reduction of cost by replacing paper based and labour-intensive methods with automated processes thus leading to higher productivity and profitability. The resultant effect of technological innovation has been the transformation in operational dimension of banks over some decades. Information technology has brought about a paradigm shift in banking operations to the extent that banks embrace information technology to enhance effective and extensive delivery of wide range of value added products and services. However, the fact that e-banking is fast gaining acceptance in the Nigerian banking sector does not assuredly signify improved financial intermediation nor would conspicuous promotion of electronic banking instruments as a delivery channel make banks economically viable, productive or profitable. These difficulties contrast with relatively recent predictions that the introduction of electronic banking would improve the performance of banks and that the initiative will dominate traditional banking (DeYoung, 2001)

These opinions, no doubt offer an interesting scenario to explore the possible impact of electronic banking on financial intermediation in Nigeria. However, the role of credit policies such as interest rate and cash reserve ratio cannot be waved aside since it has been established that these are major constraints to bank lending (Malade, 2014).

### **Theoretical Review**

The credit channel theory is apt in explaining the relationship between internet banking and financial intermediation. The theory was propounded by Friedman and Schwarz in 1963. They used historical time series and economic analysis to argue the then novel proposition that changes in the money supply profoundly influenced the US economy, especially the behaviour of economic fluctuations (Friedman and Schwarz, 1963).

The main assumption of this theory is that a Central Bank's policy affects the amount of credit that banks issue to firms and consumers for purchases, which in turn affects the real economy. The implication is that monetary policy should control the money supply and banks' ability to channel credit. Monetary policy can have an impact on the supply of intermediated credit, which in most countries is predominantly provided by banks. A bank is a financial intermediary that participates in the payment system and finances entities in financial deficit, generally the public sector, firms and some households, using the funds of entities in financial surplus, typically households.

Applying this to the study, the introduction of internet banking is the prerogative of monetary authorities and initiating such may affect banks' ability to intermediate efficiently. It is also expected that interest rate and cash reserve ratio as monetary policy tools will affect the banks' capacity to efficiently provide credit.

### **Empirical Review**

The relationship between internet banking service and financial intermediation has received considerable attention. The focus of these studies has been on bank profitability. Simpson (2002), argued that internet banking is driven largely by the prospects of operating costs minimization and operating revenues maximization. A comparison of internet banking in developed and emerging markets revealed that in developed markets lower costs and higher revenues are more noticeable. While, Furst, Lang and Nolle (2002), find that federally chartered US banks had higher Return on Equity (ROE) by using the click and mortar business model, Sullivan (2000) found no systematic evidence of the advantage of internet banking in US click and mortar banks. Furst, Lang and Nolle (2002), examined the determinants of internet banking adoption relying on a survey of national bank examiners. The study observed that more profitable banks adopted internet banking after 1998. It also revealed that large banks have more aggressive plans to offer business Internet banking services in the future than small institutions. Jayawardhena and Foley (2000) using a survey design, found that internet banking usage results in cost and efficiency gains for banks yet very few banks were using it and only a little more than half a million customers were online in U.K. This finding however might not represent current trend as the research was carried out 18 years ago.

Siam (2006), examined the effect of internet banking on bank's profitability in Jordan. The population of the study included all working banks in Jordan which have sites on the internet for the periods of 1999-2004. The result from the data analysis that was gathered from the study instrument (questionnaire) showed that there is a correlation with statistical significance between internet banking and banks profitability. The result revealed a negative effect in profitability in the short run and a positive effect in profitability in the long run.

Onay, Ozsoz and Ash (2008), investigated the impact of internet banking on banks profitability. Their analysis covered thirteen (13) banks that have adopted online banking in Turkey between 1996 and 2005. Return on assets (ROA) and return on equity (ROE) was used as proxy for bank profitability. The results of the findings show that internet banking starts contributing to banks return on equity (ROE) with a time lag of two years while a negative impact is also observed for one and half years of its adoption.

Hernando and Nieto (2007), investigated the impact of the adaptation of a transactional web site on financial performances of banks using a sample of 72 Deposit Money banks in Spain over the period 1994-2002 using regression analysis. The analysis of the sample is based on several financial performance ratios. These financial ratios measure business activity as a percentage of average total assets and profitability. The study revealed that



the adoption of the internet as a delivery channel involves a gradual reduction in overhead expenses. Similar to Onay, Ozsoz and Ash (2008), this effect is statistically significant after one and half year after adoption. The cost reduction translates into an improvement in banks profitability, which becomes significant after one and half year in terms of return on assets (ROA) and after three years in terms of return on equity (ROE). Sathye (2005), studied the impact of internet banking on performance and risk profile in Australian credit unions using regression analysis. He reported that transaction with internet banking does not have a significant impact on performance and risk profile. The study resolved that internet banking has not proved to be a performance enhancing tool in major credit unions in Australia.

Similar studies have also been carried out in Nigeria. Madueme (2010), studied the impact of ICT on banking efficiency in Nigeria employing a survey of 13 banks. Based on the CAMEL rating and a transcendental logarithmic function of the banks, it was revealed that the efficiency values obtained through the CAMEL rating system were higher during post adoption era than before adoption and estimated that a 1% increase in ICT capital on average leads to 0.9185 Naira increase in bank output post ICT adoption era. Okoro (2013), found a positive relationship between internet banking and intermediation efficiency. Ewubareh and Tuaneh (2016), also found a positive relationship between Internet banking service and monetary policy efficiency while Ibenta and Anyanwu (2017), found that internet banking service does not have any influence on banks' efficiency ratio.

The review of these studies implies that literature is yet to agree on the influence of internet banking service and financial intermediation. Other variables such as interest rate and cash reserve ratio have also been ignored while exploring this relationship. On this canvas, there is need to further explore this relationship.

## Methodology

### Data

Data was collected from 2007 to 2020 on monthly bases from the Central Bank of Nigeria (CBN) for the variables; financial intermediation (measured as ratio of currency outside banks to broad money supply), interest rate, cash reserve ratio and internet banking service for all commercial banks in Nigeria. Linear Regression models were formulated to achieve the stated objectives.

### Model Specification

The functional relationship for the study is stated as:

$Y_t = f(X_{1t}, X_{2t}, X_{3t})$ . This functional model is specified as a stochastic model, which is

Where:

$Y_t = FI_t$ ;  $X_{1t} = INTB_t$ ;  $X_{2t} = INTB_t * INT_t$  and  $X_{3t} = INTB_t * CRR_t$

Hence:

$Fi_t = \beta_0 + \beta_1 INTB_t + \beta_2 INTB_t * INT_t + \beta_3 INTB_t * CRR_t + U_t$

Where:

$FI_t$  = Financial intermediation in Nigeria in period t.

$INTB_t$  = Internet banking service value in period t

$INTB*INT_t$  = Interaction effect of internet banking service value and interest rate in period t

$INTB*CRR_t$  = interaction effect of internet banking service value and cash reserve ratio in period t.

$\beta_0$  = constant intercept

$\beta_1, \beta_2$  and  $\beta_3$  = coefficient of the explanatory variables

$U_t$  = error term

**A priori expectation**  $\beta_1, \beta_2$  and  $\beta_3 > 0$

## Results and Discussion

### Pre-diagnostic test

This study tested for data normality by applying the Jarque-Bera test. The result shows that since the p-value is 0.41965 is greater than 0.05 level of significance, the data is normally distributed and appropriate for a parametric analysis such as adopted in this study. Consequently, Unit root test was conducted to ascertain the level of stationarity of the data. The Augmented Dickey-Fuller method was applied and the result is presented in Table 1.

**Table 1:** Augmented Dickey-Fuller (ADF) Unit Root Test

Variables	Stationarity at level with (P-value)	Stationarity@ 1 <sup>st</sup> diff with (P-value)	Remark
$FI_t$	$I(0)$ -1.63 (0.0966)	$I(1)$ -4.505 (0.0000)	Stationary at first difference
$INTB_t$	$I(0)$ 1.589 (0.9723)	$I(1)$ -25.24 (0.0000)	Stationary at first difference
$INTB*INT_t$	$I(0)$ 1.878 (0.9855)	$I(1)$ - 28.18 (0.0000)	Stationary at first difference
$INTB*CRR_t$	$I(0)$ 3.111 (0.9995)	$I(1)$ -28.65 (0.0000)	Stationary at first difference

**Source:** EViews output

Table 1, shows the unit root result of the variables used for this study. It revealed that the non-stationary data was transformed by differencing each of the variable. The result of the first difference for all the variables under Augmented Dickey-Full (ADF) method indicated stationarity. This is because the p-values for each of the variables are (0.0000) less than the level of significance of 0.05. It is therefore, concluded that all the variables are stationary at first difference and all the variables are integrated at order 1, i.e.  $I(1)$ .

**Table 2:** Co-integration result

Date: 05/12/21 Time: 15:54  
Sample (adjusted): 2009M06 2020M12  
Included observations: 115 after adjustments  
Trend assumption: Linear deterministic trend  
Series: FI INTB INTB\_CRR INTB\_INT  
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.235910	75.46553	47.85613	0.0000
At most 1 *	0.199815	44.52248	29.79707	0.0005
At most 2 *	0.129099	18.88758	15.49471	0.0148
At most 3	0.025677	2.991485	3.841466	0.0837

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.235910	30.94305	27.58434	0.0178
At most 1 *	0.199815	25.63490	21.13162	0.0108
At most 2 *	0.129099	15.89609	14.26460	0.0274
At most 3	0.025677	2.991485	3.841466	0.0837

Table 2, show that P-value is significant (less than 0.05) for rank (r) = 0, thus null hypothesis of no co-integration is rejected. While for rank (r) = 1, the P-value is significant (less than 0.05); thus, null hypothesis of no co-integration cannot is rejected. The co-integration rank test results based on both the Trace and Max-Eigen statistics show that there is a co-integration among the variables under study.

**Table 3:** The Error Correction Model (ECM) and Regression result

Dependent Variable: D(FI)

Method: Least Squares

Date: 05/12/21 Time: 15:56

Sample (adjusted): 2009M02 2020M12

Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INTB)	-0.000143	0.001478	-0.096600	0.9232
D(INTB_CRR)	-2.29E-05	2.48E-05	-0.922330	0.3583
D(INTB_INT)	2.11E-05	6.47E-05	0.326036	0.7450
ECM(-1)	-0.086343	0.042516	-2.030837	0.0446
C	-0.000264	0.000380	-0.695365	0.4882
R-squared	0.056788	Mean dependent var	-0.000277	
Adjusted R-squared	0.023692	S.D. dependent var	0.004196	
S.E. of regression	0.004146	Akaike info criterion	-8.092081	
Sum squared resid	0.001960	Schwarz criterion	-7.975312	
Log likelihood	486.4788	Hannan-Quinn criter.	-8.044665	
F-statistic	1.715885	Durbin-Watson stat	2.231201	
Prob(F-statistic)	0.151283			

Table 3 shows the result of the Error Correction Model (ECM). The value of error correction term expected to lie between (0, 1). If it has negative sign, it shows convergence and, evaluates the speed of adjustment towards equilibrium. But if positive, it shows divergent towards equilibrium. The results indicate that error correction term for all the variables have the right sign (negative sign) and values' lines without range 0 and -1, except for financial intermediation. The result shows that the system corrects each month by changes in financial intermediation, INTB, INTB\*CRR and INTB\*INT to 8.63%

The results in Table 3 shows the impact of INTB, INTB\*CRR, and INTB\*INT on financial intermediation. The coefficient of internet banking which is  $\beta = -0.000143$  and P-value = 0.9232. This is an indication that a negative and insignificant relationship exist between INTB and financial intermediation (FI). The coefficient value of INTB does meet the *a priori* expectation which is positive. Therefore, holding the other explanatory variables other than INTB constant, a 1% increase in INTB, brought about a decrease in the level of financial intermediation by 0.0143%. This means that the contribution of the internet banking to financial intermediation in Nigeria is low.

Consequently, the interaction effect of internet banking and cash reserve ratio (INTB\*CRR) which has a coefficient value of  $\beta = -2.29E-05$  and P-value = 0.3583, indicates that there is a negative and insignificant interaction effect of INTB\*CRR on IE, resulting in the reduction in the financial intermediation in the banking sector.

Lastly, the coefficient value of the interaction between internet banking and interest rate (INTB\*INT) is 2.11E-05 given that the p-value is 0.7450. This entails that the interaction of

INT and credit policy variable (interest rate) positively impact on financial intermediation with an insignificant impact since the p-value is higher than the level of significance of 0.05.

**Table 4:** Multicollinearity

Variance Inflation Factors  
 Date: 05/12/21 Time: 15:59  
 Sample: 2007M01 2020M12  
 Included observations: 119

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
D(INTB)	2.18E-06	10526.57	10525.85
D(INTB_CRR)	6.16E-10	1491.511	1491.399
D(INTB_INT)	4.19E-09	19184.62	19183.30
ECM(-1)	0.001808	1.167691	1.167625
C	1.45E-07	1.000336	NA

Table 4 shows that there is no multicollinearity, since the value of the Uncentred VIF is greater than the centred VIF.

### Discussion of Findings

Findings of the study revealed that there is a negative insignificant relationship between internet banking and financial intermediation in Nigeria. The result of this study is inconsistent with work of Okoro (2014), who studied the impact of selected e-payment instruments on the intermediation efficiency of the Nigerian economy. The study found that there a significant relationship between internet banking service value and intermediation efficiency of the Nigerian economy within the period under study. The result of this study is also not consistent with the study of Siam (2006), who found a positive effect of internet banking on profitability in the long run. In addition, the result is not in consonance with the submission of Jayawardhena and Foley (2000) who are of the opinion that internet banking mainly promotes cost saving, reaching new segments of the population, efficiency, enhancement of the banks' reputation and better customer service and satisfaction for banks. Nevertheless, this finding is in tandem with the study of Sathye (2005), who found that internet banking has not proved to be a performance enhancing tool in major credit unions in Australia. It also conforms to the study of Ibenta and Anyanwu (2017), who found that internet banking service does not have any influence on banks' efficiency ratio.

Two implications can be derived from this finding. First, the insignificant contribution of internet banking to financial intermediation maybe as a result of the inability of banks to scale up internet banking infrastructure and make it available to a large and significant customer base. Secondly, the cost of internet banking service might be an impediment to

banks' ability to intermediate efficiently. This finding also negates the credit channel theory which depicts the notion that policies initiated by regulatory authorities have the potential of determining the volume of lending by banks.

The study revealed that the interaction between internet banking and interest rate have a positive insignificant effect on financial intermediation. This negates the findings of Malade, 2014; Oni and Ozemhoka, 2013; Berger and Bouwman, 2009 and Olokoyo, 2011. Their findings suggest a critical link between interest rate and financial intermediation. This implies that interest rate does not have any influence on the relationship between internet banking and financial intermediation. Lastly, findings revealed that the interaction between internet banking and cash reserve ratio has a negative insignificant effect on financial intermediation. This suggest that cash reserve ratio does not determine the effect of internet banking on financial intermediation.

### **Conclusion and Recommendations**

The study was carried out to investigate the effect of internet banking on financial intermediation in the Nigerian banking industry, as well as the interaction effect of interest rate and cash reserve ratio. The study concludes that internet banking service has a negative insignificant effect on financial intermediation. The study also revealed that the interaction between internet banking and interest rate has a positive insignificant effect on financial intermediation while the interaction between internet banking and cash reserve ratio has an insignificant effect on financial intermediation. Based on findings, the following recommendations are made.

- i. The Central bank of Nigeria should make efforts to alleviate the cost of internet banking borne by banks. This can be done by bearing some of the costs associated with internet banking. This will certainly reduce the burden on banks and make more money available for intermediation. Banks and regulatory agencies should ensure that internet banking mechanism is well publicised to capture more customers so that they can key into the electronic banking initiative of the CBN.
- ii. Banks and regulatory agencies should ensure that internet banking mechanism is well publicised to capture more customers so that they can key into the electronic banking initiative of the CBN.
- iii. Monetary authorities should pay attention to Interest rate spread and cash reserve ratio and ensure that it contributes positively to intermediation spread.

## References

- Abaenewe, Z. Ogbulu, O., & Ndugbu, M. (2013). Electronic banking and bank performance in Nigeria, *West African Journal of Industrial & Academic Research*, 6(1), 171-187.
- Abdulrahman, B. (2010). The role of monetary Policy on Economic Activity in Sudan: An empirical investigation, 1990-2004. *Journal of Human Science*, 44(2), 16-25.
- Abubakar, A. (2014). The effects of electronic banking on growth of deposit money banks in Nigeria. *European Journal of Business and Management*, 6(33), 79-89.
- Abubakar, A., Shagari, J., & Olusegun, K. (2015). The relationship between electronic banking and liquidity of deposit money banks, *International Journal of Economics, Commerce and Management*, 3(9), 830-847.
- Adewuyi, I. (2011). Electronic banking in Nigeria: Challenges of the regulatory authorities and the way forward, *International Journal of Economic Development Research and Investment*, 2(1), 149-156.
- Aduda, J. & Kingoo, N. (2012). The relationship between electronic banking and financial performance among commercial banks in Kenya, *Journal of Finance and Investment Analysis*, 1(3), 99-118.
- Ajayi, F. & Atanda, A. (2012) Monetary policy and bank performance in Nigeria: A two-step cointegration approach. *African Journal of Scientific Research*, 9(1), 125-140
- Akinlo, A. (2010). *The dynamics of money, output and prices in Nigeria*, Paper presented at the Central Bank of Nigeria 2007 Executive Policy Seminar.
- Aladwani, A. (2001). Online banking: A field study of drivers, development challenges and expectations, *International journal of information Management*, 21(3), 213-225.
- Ali, P. & Emenike, O. (2016) Impact of automated teller machine on bank services delivery in Nigeria: A stakeholder analysis. *ICT Journal*, 9(1), 64-72.
- Al-Jarrah, I., Al-Zu'bi, Z., Jaara, O. & Alshurideh, M. (2012). Evaluating the impact of financial development on economic growth in Jordan, *International Research Journal of Finance and Economics*, 94(10), 11-19.
- Al-Laham, M., Al-Tarawneh, H. & Abdallat, N. (2009). Development of electronic money and its impact on the Central bank role and monetary policy, *Issues in Informing Science and Information Technology*, 6(1), 339-349.
- Berger, A. & Bouwman, C. (2009). Bank credit creation, *The Review of Financial Studies*, 22(9), 12-23.

- Bikker, J. & Bos, J. (2008). *Bank Performance: A theoretical and empirical framework for the analysis of profitability competition and efficiency*, New York: Routledge Publications.
- Business News (2016). *Credit to private sector rises to N21.425tn in second quarter*, Retrieved February 19, 2017, from <http://businessnews.com.ng>.
- Central Bank of Nigeria (2009). *Central Bank of Nigeria (CBN) Report, 2009*.
- Corb, H. (2012). *Interest rate swaps and other derivatives*, New York: Columbia Business School.
- Daniel, E. (1999). Provision of electronic banking in the UK and the Republic of Ireland, *International Journal of Bank Marketing*, 17(2), 72-82.
- DeYoung, R. (2001). The financial performance of pure play internet banks economic perspectives, *Journal of Small Business Management*, 25(1), 60-75.
- Durgun, O. & Timur, M. (2015). The effect of electronic payment systems on monetary policies and Central Banks, *Social and Behavioural Sciences*, 195(2015), 680-685.
- Ehimare, O. (2013). *Nigerian banks' efficiency performance: A post 2004 banking reforms evaluation*, Unpublished doctoral thesis, Covenant University, Ota, Ogun state. Retrieved September 12 from <http://eprints.covenantuniversity.edu.ng/>.
- Ekwueme, C., Egbunike, P., & Amara, O. (2012). An empirical assessment of the operational efficiency of electronic banking: Evidence of Nigerian banks, *Review of Public Administration and Management*, 1(2), 108-138.
- Enejeta, E. (2018). *Banks' credit to Nigeria's economy declines in 2018*, *Financial watch*, Retrieved 21 May, 2018 from <https://www.financialwatchngr.com>
- Ewubare, D. & Tuaneh, G. (2016). Impact of electronic banking instruments on monetary policy efficiency in Nigeria, *Academy of Management and Economics*, 1(1), 1-5
- Friedman, M. & Schwartz, A. (1963). *A monetary history of the United States, 1857-1960* Princeton University Press; Princeton, NJ,
- Furst, K., Lang, W. & Nolle, D. (2002). Internet banking: Developments and prospects, *Journal of Financial Services Research*, 22(1), 95-117
- Ibenta, S. & Anyanwu, F. (2017). Financial innovation and efficiency on the banking sub-sector: The case of deposit money banks and selected instruments of electronic banking, *Asian Journal of Economics, Business and Accounting* 2(1), 1-12.



- Ikhide, S. (2009). Measuring the operational efficiency of commercial banks in Namibia, *South African Journal of Economics*, 76(10), 586-595.
- Jayawardhena, C. & Foley, P. (2000). Changes in the banking sector – the case of internet banking in the UK. *Journal of Internet Research: Electronic Networking Application and Policy*, 10(1), 19-30.
- Kamau, A. (2011). Intermediation efficiency and productivity of the banking sector in Kenya, *Interdisciplinary Journal of Research in Business*, 1(9), 12-26.
- Madueme, I. (2010) Evaluation of the impact of information communication technology on banking efficiency using the transcendental logarithmic production function and CAMEL rating, *International Journal of Engineering Science and Technology*, 2(1), 1-6.
- Malade, M. (2014). Determinants of commercial bank lending. Evidence from Ethiopian commercial banks, *European Journal of Business and Management*, 6(20), 109-117.
- Ndugbu, M. & Okere, P. (2015). Monetary policy and the performance of deposit money banks: The Nigerian experience, *European Journal of Business and Management*, 7(17), 65-72
- Nzotta, S. (2004). *Money, banking & finance: theory and practice*, Husdon-Judge Publications Owerri.
- Nzotta, S. & Okereke, E. (2009), Financial deepening and economic development of Nigeria: An empirical investigation, *African Journal of Accounting, Economics, Finance and Banking Research*, 5(5), 55-66.
- Okereke, E. (2009). *Money and the Nigerian financial system*, Owerri, Alvan Publications.
- Okoro, A. (2013). Impact of electronic banking instruments on the intermediation efficiency of the Nigerian economy, *International Journal of Accounting Research*, 1(4), 1-9.
- Olokoyo, F. O. (2011). Determinants of commercial banks' lending behaviour in Nigeria, *International Journal of Financial Research*, 2(2), 31-40.
- Onay, C., Ozsoz, H. & Ash, D. (2008). The impact of internet banking on banks profitability: The case of Turkey, *Oxford Business and Economics Program June*, 22-24.
- Oni, A. (2010). Impact of banking sector's consolidation on sectoral allocation of credit in Nigeria. *Journal of Banking, Chartered Institute of Bankers of Nigeria*, 1(1), 28 -35.

- Oni, A. & Ozemhoka, A. (2013). The impact of monetary policy on bank credit creation in Nigeria: 1980-2010, *International Journal of Business and Social Science*, 4(15), 160-165.
- Popovska-Kamnar, N. (2014). The use of electronic money and its impact on monetary policy, *Journal of Contemporary Economic and Business Issues*, 1(2), 79-92.
- Punita.R. & Somaiya, K. (2006). Monetary policy: Its impact on the profitability of banks in India, *Intermediate Business and Economics Research Journal*, 5(3), 15-19.
- Sathye, M. (2005). The impact of internet banking on performance and risk profile: Evidence from Australian credit unions, *Journal of Bank Regulation*, 6(2), 163-174.
- Sanusi, J. (2002). *Central Bank and the macroeconomic environment in Nigeria*, Lecture delivered to participants of the Senior Executive Course no. 24 of the National Institute for Policy and Strategic Studies (NIPSS), Kuru on 19th August, 2002.
- Siam, A. (2006). Role of the electronic banking services on the profiles Jordanian banks, *American Journal of Applied Sciences*, 3(9), 199-204.
- Simpson, J. (2002). The impact of the internet in banking: observations and evidence from developed and emerging markets, *Telematics and Informatics*, 19(1), 315-330.
- Sufian, F. & Chong, R. (2008). Determinants of bank profitability in developing economy: Empirical evidence from the Philippines, *Asian Academy of Management Journal of accounting and finance*, 4(1), 91-112.
- Sullivan, R. (2000). How has the adoption of internet banking affected performance and risk in banks? A look at internet banking in the tenth federal reserve district, *Financial Industry Perspectives*, 23(5), 1-16.
- Takyi, G. & Poku, J. (2015). The adoption and impact of internet banking on the Ghanaian economy (a case study of Zenith bank Ghana Ltd), *Innovative Journal of Business and Management*, 3(1), 52-62