



International Journal of Research Publications

FINANCIAL APPRAISAL OF ONLINE BANKING ON DEPOSIT MONEY BANKS IN NIGERIA

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Abstract

The objective of the study was to examine the financial appraisal of online banking on the Deposit Money Banks in Nigeria between 1991 and 2015. The study adopted Fully Modified Ordinary Least Squares (Fully Modified OLS) to measure the relationship among the variables. The finding of the study showed that interaction of online banking and Deposit Asset Ratio has positive significant impact on the profitability of the Deposit Money Banks in Nigeria in the long run. In addition, the finding of the study showed that interaction of online banking and Loans to Asset Ratio has significant impact on the profitability of the Deposit Money Banks in Nigeria in the long run. The ECM was correctly signed and significant at 5% level of significance. The speed of adjustment of the ECM was 134.72%. Lastly, the short run showed that loan to asset ratio and inflation were significant at 0.05 level of significance. The study therefore recommends that Deposit Money Banks should intensify effort on the adoption of online banking.

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Keywords: Online banking; Deposit Money Bank; Nigeria; Fully Modified OLS

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1. Introduction

The financial system has become sophisticated and large that the use of teller posts and other print oriented banking services cannot sustain the current growth in the financial institutions. This trend has grown to the extent that clients of Deposit Money Banks prefer to carry out banking transactions out of the four corners of the banking halls. Hence, attention is drawn to the need to operate banking services from homes and offices, and even at anywhere the needs arise to make payment or have the receipts of business endeavours. This makes Amu and Nathaniel (2016) to assert that banking has grown to the point where information and communication technology has become necessary impetus in helping banks to reach these goals. They conclude that information and communication technology (ICT) has created the innovation required by banks to be efficient and therefore more customers' oriented services are provided.

The adoption of internet banking has some implications on the Deposit Money Banks. One, it makes the Deposit Money Banks to be better branded as potential customers would be preferred to do business with banks whose system operates with easy transactions. Two, Deposit Money Banks can reduce unnecessary cost of keeping too many staff, thus spend less on employees compensations. Three, Deposit Money Banks can maximize profits as a result of the first implication of adoption of online banking. When the needs of the customers are met within relatively shortest period of time with convenience, they would increase their patronage (Pyung, Scruggs & Nam, 2002).

Going with the study of Mawutor (2014), the adoption of e- banking is expected to affect the mixture of financial services provided by Deposit Money Banks. Hence, it stimulates the financial performance of the Deposit Money Banks. Large number of studies has been carried out in Nigeria on the impact of internet banking on the financial performance of the Deposit Money Banks such as Abaenewe, Ogbulu and Ndugbu (2013) and Amu and Nathaniel (2016). However, none of the studies known to the author has examined the interaction between online banking and profitability ratios. This study wants to use this as an improvement from previous studies.

The study shall contribute to the existing literature in the following ways – (1) it considers the interaction of online banking with financial ratios which is an innovation on the previous studies; (2) it made use of Fully Modified Ordinary Least Squares to account for the presence of serial correlation and endogeneity which is also an innovation from previous studies known to the author that have never considered the problems of endogeneity as studies of this nature may have some series correlating with one another; (3) the study makes use of dummy variable to proxy for online banking and as such it took account of annual data. Therefore, the study is able to account for pre-online banking adoption and post-online banking adoption.

The overall objective of the study is to examine the financial implication of online banking on the performance of Deposit Money Banks. The specific objectives of the study are to: investigate the impact of deposit-asset ratio on profitability ratio of Deposit Money Banks; ascertain the impact of loan-asset ratio on profitability ratio of Deposit Money Banks; assess the impact of online banking on profitability ratio of Deposit Money Banks; examine the impact of interaction between online banking and deposit-asset ratio on profitability ratio of Deposit Money Banks; and evaluate the impact of interaction between online banking and loan-asset ratio on profitability ratio of Deposit Money Banks.

The following hypotheses are derived from the stated objectives:

- i. Deposit asset ratio does not have significant impact on profitability ratio of Deposit Money Banks in Nigeria
- ii. Loan asset ratio does not have significant impact on profitability ratio of Deposit Money Banks in Nigeria
- iii. Online banking does not have significant impact on profitability ratio of Deposit Money Banks in Nigeria
- iv. The interaction between online banking and deposit-asset ratio does not have significant impact on the profitability ratio of Deposit Money Banks in Nigeria;

2. Literature Review

All Theories have emerged on the online banking and these theories include the Technology Acceptance Model (TAM) of Davis, Bagozzi, and Warshaw (1992); the Theory of Planned behaviour (TPB); Social Construction Theory and Diffusion of Innovation Theory. The Technology Acceptance Model (TAM) of Davis, Bagozzi, and Warshaw (1992) explained the reasons why the users choose to accept and adopt a new information system. The Theory of Planned Behaviour (TPB) shows that human behaviour is influenced by the intention to perform some particular behaviour. The theory is relevant to the adoption of internet banking because it provides the basis to understanding and predicting the acceptance of new information (Ajzen & Fishbein, 2002).

On the other hand, Social Construction Theory emphasised how people makes use of technology. It further explained that adoption of new technology goes in line with understanding how it can be socially integrated within the society. One of the authors on this theory, Andrews (2012) explained that the theory shows how adoption of new technology can have impact on the society. Lastly, Diffusion of Innovation Theory which according to Rogers (1983) the theory seeks to explain how, why, and at what rate new ideas and technology spread through cultures. Robert and Amit (2003) added that customers' right perception of the advantages of new technology makes them to embrace it.

Empirical studies have examined the impact of online banking on the performance of banks. Using Engle-Granger co- integration model, Amu and Nathaniel (2016) studied the relationship between electronic banking and the performance of Nigerian Deposit Money Banks for the sample period from January 2009 to December 2013. They found out that POS are co-integrated with demand deposits. Ngango, Mbabazize and Shukla (2015) examined the contribution of E-banking towards banking on performance of banking institutions in Rwanda with the use of descriptive research design. They established that Electronic banking system like ATM, Pay direct, electronic check conversion, mobile telephone banking and E-transact has a great impact on bank performance because they increase profitability, reduce bank cost of operations, and increase bank asset and bank efficiency.

In the study by Stephanie and Moses (2015) in Kenya on the effects of internet-banking on financial performance of financial institutions in Kenya, using a descriptive survey design, they showed that impact of ICT adoption on the performance of banking sector mainly refers to time reductions and quality improvements, rather than cost reductions as reported. Using adopt random effect model (REM) and fixed effect model (FEM), Dinh, Lee and Lee (2015) evaluated the impact of internet banking to performance of banks in Vietnam from 2009-2014. They showed that internet banking had an impact on bank profitability through an increase of income from service activities. John (2014) assessed the impact of electronic banking on the profitability of a bank in Ghana. He made use of primary data and 150 questionnaires were administered to the interviewees from the selected branches of the Agricultural Development Bank. He found out a significant increase in the net profit margin of the bank in the year (2011) E-banking was introduced.

Using ratio and correlation analysis, paired T- test and regression analysis, Rengasamy (2014) examined the impact of Loan Deposit Ratio on the profitability of Malaysian commercial banks for the period of 2009 to 2013. His study included all the eight locally owned commercial banks in Malasia. Loan deposit ratio of the banks was the independent variable of the study. His dependent variable was profitability which was measured through Return on Assets (ROA). He obtained data from the annual reports of the banks. He made use of ratio analysis along with descriptive correlation analysis, paired T-test and regression analysis. His result indicated that there was a positive and non significant impact of LDR on ROA in five banks (Bank 1, 2, 3, 4 and 8). Further his study revealed that only one bank (Bank 5) had a negative and non significant impact of LDR on ROA and bank 7 had positive and significant impact.

Abaenewe, Ogbulu and Ndugbu (2013) investigated the profitability performance of Nigerian banks following the full adoption of electronic banking system. They collected data collected and tested the pre and post-adoption of e-banking performance using a standard statistical technique for independent sample at 5 percent level of significance for performance factors such as ROE and ROA. Their study revealed that the adoption of electronic banking has positively and significantly improved the returns on equity (ROE) of Nigerian banks. They also revealed that e-banking has not significantly improved the returns on assets (ROA) of Nigerian banks. The findings of this study have motivated new recommendations for bank customers, bank management and shareholders with regard to electronic banking adoption.

Aymen (2013) used a static panel to study empirically the relationship between capital and financial performance through a sample of 19 banks in Tunisia from 2000-2009, he found that the relationship between capital and financial performance (ROA, ROE, NIM) is positive but only the relationship between capital and return on assets is statistically significant. Lastly, Sana, Mohammad, Hassan and Momina (2011) examined the impact of e-banking on the profitability of Pakistani banks, in particular using qualitative data. Their study covered twelve banks across Pakistan. Their study was qualitative in nature which examined different objectives that determines the performance of banks mainly in terms of profitability. The results of their study showed that e-banking has increased the profitability of banks; it has enabled the banks to meet their costs and earn profits even in the short span of time. They found out that for banks, the main motive to adopt e-banking is to increase their clientage and to retain their customers.

3. Methodology

The study is designed as an experimental research. The sample size is made up of 21 Deposit Money Banks in Nigeria. The data for this study were obtained from Central Bank of Nigeria Statistical Bulletin and CBN Financial Stability Report from 1991 to 2015. The data covered the period of 25 years. The estimation begins by conducting stationarity test. In this study, we employ Augmented Dickey Fuller (ADF) test to investigate the presence of unit root. We employ Johansen's approach to measure this long-run equilibrium relationship among the variables.

The presence of cointegration in the series makes us to proceed to fully modified ordinary least squares (FMOLS). The researcher also carried out post-diagnostic test. The post diagnostic test carried out were normality test using Jarque Bera Statistic and Wald test. The study makes use of multiple regression analysis as such the model stated in Equation (1) captured all the variables. The model for this study is specified as:

$$ROA = f(DAR, LAR, ONB, BKS, LIT, INF, DAR*ONB, LAR*ONB) \dots \dots \dots (1)$$

In econometric form, it is written as:

$$ROA_t = \alpha_0 + \alpha_1 DAR_t + \alpha_2 LAR_t + \alpha_3 ONB_t + \alpha_4 BKS_t + \alpha_5 LIT_t + \alpha_6 INF_t + \alpha_7 DAR * ONB_t + \alpha_8 LAR * ONB_t + \mu_t$$

$$\alpha_0 > 0, \alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0, \alpha_5 > 0, \alpha_6 < 0, \alpha_7 > 0, \alpha_8 > 0 \dots \dots \dots (2)$$

Where:

ROA = return on asset, DAR= deposit asset ratio, LAR = loan asset ratio, ONB = dummy variable for online banking, BKS = log of total asset, LIT = adult literacy, INF = inflation rate, *= interaction sign, μ = stochastic term.

Equation 2 is re-specified in Error Correction form and it gives us Equation 3 bellow.

$$\Delta ROA_t = \alpha_0 + \alpha_1 \Delta DAR_t + \alpha_2 \Delta LAR_t + \alpha_3 \Delta ONB_t + \alpha_4 \Delta BKS_t + \alpha_5 \Delta LIT_t + \alpha_6 \Delta INF_t + \alpha_7 \Delta DAR * ONB_t + \alpha_8 \Delta LAR * ONB_t + \alpha_9 ECM_{t-1} + \mu_t$$

Where:

ECM is Error Correction Mechanism.

4. Data Presentation and Analysis of Results

Data Presentation

The data used for the study were presented as follows:

Table 1: Data

Year	ROA	DAR	LAR	BKS	ONB	LIT	INF
1991	31.1	0.038639	0.266409	117.5119	0	54	12.7
1992	-33.0	0.198816	0.268463	159.1908	0	54	44.81
1993	49.1	0.185648	0.290345	226.1628	0	55	57.17
1994	0.3	0.142793	0.319232	295.0332	0	55	57.03
1995	78.2	0.139566	0.375367	385.1418	0	55	72.81
1996	37.1	0.114377	0.369323	458.7775	0	57	29.29
1997	49.0	0.077518	0.659766	584.375	0	57	10.67
1998	-5.8	0.064042	0.392873	694.6151	0	57	7.86
1999	4.5	0.069962	0.301644	1070.02	0	57	6.62
2000	9.37	0.076766	0.323999	1568.839	0	57	6.94
2001	14.36	0.063361	0.354317	2247.04	0	57	18.87
2002	-4.86	0.046363	0.34502	2766.88	0	57	12.89
2003	6.38	0.061157	0.397011	3047.856	1	57	14.03
2004	3.81	0.049692	0.404778	3753.278	1	57	5.01
2005	9.51	0.026666	0.437798	4515.118	1	63.1	17.85
2006	4.97	0.027276	0.35192	7172.932	1	57.2	8.24
2007	3.91	0.021353	0.438319	10981.69	1	66.9	5.38
2008	3.7	0.024734	0.489926	15919.56	1	66.9	11.68
2009	-8.9	0.026954	0.508601	17522.86	1	66.9	10.12
2010	3.9	0.026979	0.444647	17331.56	1	66.9	9.72
2011	0.0	0.062795	0.37701	19396.63	1	66.9	10.12
2012	2.4	0.097367	0.382844	21288.14	1	66.9	9.86
2013	2.3	0.136365	0.411732	24301.21	1	66.9	9.5
2014	2.5	0.150391	0.469021	27481.53	1	66.9	11.5
2015	2.5	0.140652	0.465409	28117.62	1	66.9	14.6

Source: CBN Statistical Bulletin, (2016). CBN Financial Stability Report, (2016)

The researcher employed the Augmented Dickey Fuller (ADF) to test for unit root in the series and the Schwarz criteria was used to select the lag selection. The detail of the unit root test was provided in Table 2.

Table 2: Unit root test

Variables	Level/Difference	Critical Value (ADF)	ADF	ORDER
ROA	Level	-3.0124	-1.6479	
	First Diff.	-3.0124	-3.7014*	1(1)
DAR	Level	-2.9981	-2.9981	
	First Diff.	-3.0124	-7.9626*	1(1)
LAR	Level	-2.9919	-7.9626*	1(0)
ONB	Level	-2.9540	-1.0000	
	First Diff.	-3.0124	-4.7958*	1(1)
BKS	Level	-2.9981	0.3097	
	First Diff.	-2.9981	-2.2746	
	Sec Diff.	-3.0300	-4.5714*	1(2)
INF	Level	1.8252	-1.8252	
	First Diff.	-3.0124	-4.9875*	1(1)
LIT	Level	-2.9981	0.5851	
	First Diff.	-3.0124	-9.3556*	1(1)
DAR X ONB	Level	-2.9919	0.3408	
	First Diff.	-3.0124	-3.6487*	1(1)
LAR X ONB	Level	-2.9919	-0.9121	
	First Diff.	-3.0124	-4.7526*	1(1)

* indicates significance at 5% level.

Source: Researcher's Regression Output (Eviews 9) (2019)

Table 2 shows the results of the unit root test estimation on the series using Augmented Dickey-Fuller. All the series are stationary after first difference at 5% significance except loan asset ratio (LAR) which was stationary at level and bank size (BKS) which was stationary at second difference.

The researcher proceeds to co-integration test after confirming the stationarity of each series. The result was given in Table 3. The Johansen Co-integration Test was used.

Table 3: Trace Test Results of Co-integration Test

Null Hypothesis	Alternative Hypothesis	Statistics	Critical Values	P- Values
Model 1; SERIES: ROA, DAR, LAR, ONB, BKS, LIT, INF				
$r = 0$	$r \geq 1$	287.9137	125.6154	0.0000
$r \leq 1$	$r \geq 2$	176.9463	95.75366	0.0000
$r \leq 2$	$r \geq 3$	99.86786	69.81889	0.0000
$r \leq 3$	$r \geq 4$	49.27005	47.85613	0.0366
$r \leq 4$	$r \geq 5$	24.24097	29.79707	0.1904
$r \leq 5$	$r \geq 6$	10.85083	15.49471	0.2208

Source: Researcher's Regression Output (Eviews 9)

Table 3 shows that there are four co-integrating equations for Trace test. This result shows that the series in each of the models are co-integrated and therefore they have an error correction representation.

The researcher estimates the model for the study and report the output in Table 4. The Fully Modified OLS was used to estimate the model.

Table 4: Dependent Variable: ROA

Variable	Coefficient	t- Statistics
DAR	-368.4242*	-4.3804
LAR	146.6809*	5.7188
LIT	1.1187	0.9170
INF	1.3238*	7.5878
BKS	-0.0009	-1.0829
ONB	43.9401	1.6195
DAR*ONB	430.6992*	3.5759
LAR*ONB	-198.8026*	-3.1101
C	-95.5623	-1.3765
R-squared	0.5973	
Adjusted R-squared	0.3825	
S.E. of regression	17.7804	
Long-run variance	61.7895	

Note: t- Statistic; *1%, **5% and ***10% Level of Significance

Source: Researcher's Computation (Eviews 9) (2019)

The coefficient of determination is 0.5973 which shows that 59.73% of the variation in return on asset (ROA) is explained by the independent variables. The Fully Modified

OLS used as technique of estimation does not provide value for F-Statistic and DW Statistic. The reason is that it has accounted for serial correlation and endogeneity in its estimation. The coefficients of deposit asset ratio (DAR), loan asset ratio (LAR), inflation (INF), interaction of deposit asset ratio (DAR) and online banking (ONB), and interaction of loan asset ratio (LAR), and online banking (ONB) are significant. Other variables are not significant.

Deposit asset ratio (DAR) is negatively related to return on asset (ROA). Loan asset ratio (LAR), adult literacy (LIT), inflation (INF) and online banking (ONB) are positively related to return on asset (ROA). The coefficient of deposit asset ratio (DAR) does not have the expected sign as expected but it is significant at 5%. A 1% increase in deposit asset ratio (DAR) leads to a decrease of 368.42% in return on asset (ROA) of Deposit Money Banks in Nigeria. In addition to the finding, the coefficient of loan asset ratio (LAR) has the expected sign and it is significant at 5%. A 1% increase in loan asset ratio (LAR) leads to 146.68% increase in return on asset (ROA) of Depositor Money Banks in Nigeria. Also, the adult literacy (LIT) coefficient of dummy for online banking (ONB) is significant at 5% but does not have the expected sign. 1% increase in dummy for online banking (ONB) increase return on asset (ROA) of Deposit Money Banks in Nigeria by 43.94%. More so, the coefficient of bank size (BKS) is negative and not significant. A 1% increase in bank size (BKS) leads to a decrease of 0.0009% decrease in deposit money banks' profitability in Nigeria.

Similarly, the coefficient of adult literacy (LIT) is brought in to explain the impact of literacy on the adoption of online banking in Nigeria. The coefficient is positive but not significant. This showed that adult literacy improves the profitability of the deposit money banks in Nigeria but it does not have significant impact. A 1% increase in the rate of adult literacy increases the profitability of the deposit money banks in Nigeria by 1.12%. Still on the table, the coefficient of inflation (INF) is positive as expected. A 1% increases in inflation rate in the country increases profitability of the deposit money banks in Nigeria by 1.32%.

It can be seen that the coefficient of the interaction of deposit asset ratio and dummy for online banking (DAR*ONB) is positive as expected and significant at 5%. This shows that the profitability of Deposit Money Banks depends on the interaction between deposit asset ratio and online banking. Deposit Money Banks increase their profitability as they make use of online banking. Customers are able to access their funds conveniently and they therefore increase their deposit. A 1% increase in the interaction of deposit asset ratio and dummy for online banking increase Deposit Money Banks' profitability by 430.70%. Lastly, the coefficient of the interaction of loan asset ratio and dummy for online banking (LAR*ONB) is negative contrary to expectation but is significant at 5%. This shows that the profitability of Deposit Money Banks

depends on the interaction between loan asset ratio and online banking. A 1% increase in loan asset ratio reduces the profitability of deposit money bank by 198.80%.

The non-contribution of loan asset ratio to profitability of deposit money banks despite the introduction of online banking may have come from higher interest rate charged by the Deposit Money Banks.

The parsimonious ECM for Fully Modified OLS is given in Table 5 and it was computed by generating the error correction term. We first estimated the ECM without lagging the variables. We then lagged the variables and this gave us the over-parameterized ECM. In the over-parameterized ECM, we removed the variables that are not significant. Thus, we have the estimation shown in Table 5.

Table 5.4: Dependent Variable: D(ROA)

Variable	Coefficient	t- Statistics
LAR	149.9124*	3.7311
D(INF)	0.7323*	2.8061
LAR(-1)	-171.9307*	-4.4913
ECM	-1.3472	-5.9390
C	7.7572	0.4018
R-squared	0.8169	
Adjusted R-squared	0.7738	
S.E. of regression	12.3846	
Long-run variance	186.8749	

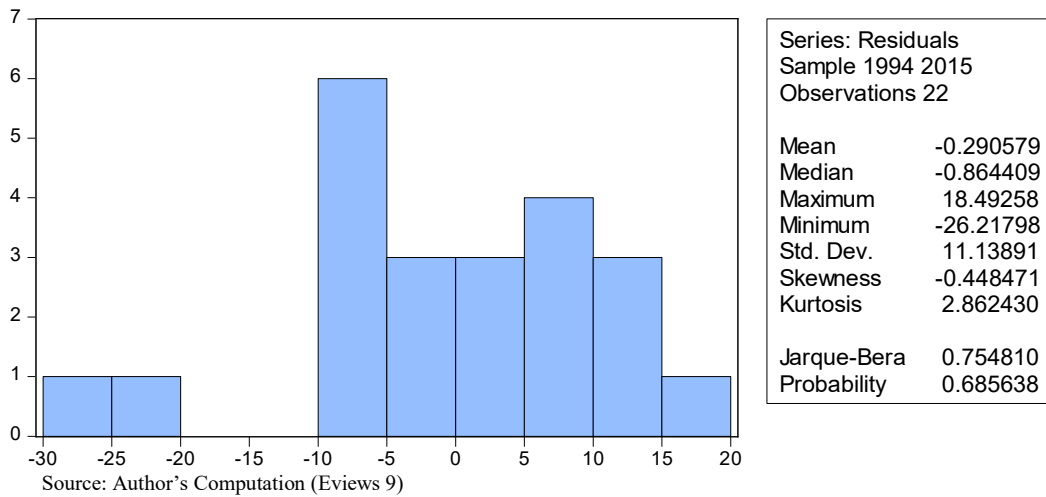
Note: *t-Statistic*; *1%, **5% and ***10% Level of Significance

Source: Author's Computation (Eviews 9)

The short run dynamics is shown in Table 5 and the coefficient of determination (R^2) is 0.8169, and it shows that 81.69% of the variation in profitability of the Deposit Money Banks in Nigeria is explained by the explanatory variables. As earlier explained, the Fully Modified OLS used as technique of estimation does not provide value for F-Statistic and DW Statistic. The reason is that it has accounted for serial correlation and endogeneity in its estimation. The ECM is correctly signed, that is, it has negative sign and significant. ECM is significant at 5%. The result shows that 134.72% of the errors in the previous times disequilibrium is corrected.

The coefficient of loan asset ratio (LAR) is positive as expected and significant at 5%. It shows that 1% increases in loan asset ratio increases profitability of Deposit Money Bank by 149.91%. In the same vein, the coefficient of inflation has the expected sign and significant at 5%. A 1% increases in inflation rate in the country increases profitability of the Deposit Money Banks in Nigeria by 0.73% in the short run. Lastly, on the table, the coefficient of lagged loan asset ratio is negative and significant at 5%. A 1% increase in loan asset ratio decreases profitability of Deposit Money Banks by 171.93%.

We employed the Jarque Bera Statistic to confirm the existence of normality in the model.



The value for Jarque Bera Statistics is 0.7548 and its probability is 0.6856; and it shows that there is no issue of normality in the model because the probability value of 0.6856 is greater than the 0.05 level of significance.

We used the Wald statistic to test whether the co-integration coefficients is equal to 0 or not. Table 6 shows the result of the Wald test.

Table 6: Wald Test: Equation: FMOLS

Test Statistic	Value	Probability
F-statistic	17.64298	0.0000
Chi-square	70.57190	0.0000
Null Hypothesis: $C(1)=C(2)=C(3)=C(4)=0$		
Null Hypothesis Summary:		
Normalized Restriction (= 0)	Value	Std. Err.
C(1)	149.9124	40.17880
C(2)	0.732341	0.260980
C(3)	-171.9307	38.28110
C(4)	-1.347253	0.226847

Restrictions are linear in coefficients.

Source: Author's Computation (Eviews 9) (2019)

In the Wald test conducted above, the p-values for t-statistic and F-statistic are less than 5% level of significance. This shows that co-integration regressor coefficient value does not equal to zero. The implication of this value is that all independent variables have significant association with the dependent

variable; that is, the coefficients obtained from the Fully Modified OLS significantly have association with the return on asset (ROA).

These findings have shown that in the long run, online banking interacting with loan asset ratio and deposit asset ratio have significant impact on the profitability of the Deposit Money Banks. Deposit

Money Banks can increase their profitability by increasing their investment in online banking. These findings are in tandem with the study conducted by Sana, Mohammad, Hassan and Momina (2011). They found out that online banking plays a significant role in explaining the profitability of the Deposit Money Banks. Though the findings contradicted that of Abaenewe, Ogbulu and Ndugbu (2013), they found out that online banking does not have impact on the return on asset (ROA). This study by Abaenewe, Ogbulu and Ndugbu (2013) failed to consider the interacting role of online banking.

5. Conclusion and Recommendations

Considering the results of the findings of this study which is in agreement with most literature empirically reviewed, it is concluded that online banking has a significant impact on the performance of Deposit Money Banks. The study therefore recommends that Deposit Money Banks should intensify effort on the adoption of online banking. In addition, the management of Deposit Money Banks should encourage their customers to embrace online banking because it increases the deposit to asset ratio of the Deposit Money Banks. Furthermore, the management of the Deposit Money Banks should intensify effort on adult literacy. They can do this by organizing public lectures or seminars to sensitize the public on the relevance of online banking to them. Lastly, the management of Deposit Money Banks should encourage customers in using online banking as this stimulate prompt repayment of loans.

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