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Financial technology and the banking sector performance in Nigeria (2005-2020)

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ABSTRACT

This study examined financial technology and banking sector performance in Nigeria. The specific objectives are to examine the effect of financial technology on return on assets (ROA), return on equity (ROE), interest income (II) and non-interest income (NII) of Deposit Money Banks (DMBs) in Nigeria. The study was anchored on Technology Acceptance Model (TAM) and Central Bank of Nigeria (CBN) statistical bulletin and Nigeria Deposit Insurance Corporation (NDIC) report of various years form the data source which were subjected to Auto Regressive Distributed Lag (ARDL) technique to test the interaction between independent variables namely payment system, automated clearing services and remittance services with the dependent components in return on asset, return on equity, interest income and non-interest income at 5% level of significance. Financial technology significantly explained the variation in ROA, ROE and non-interest income DMBs in Nigeria except the variation in interest income. The study concludes that financial technology significantly explained the variation in banking sector performance components in ROA, ROE, and non-interest income. The effect of financial technology on performance of the banking sector is inconclusive thus financial technology could not be said to improve and exert the required impact on the banking sector performance within the period studied. Hence, the study recommends among others that the deposit money banks should do more in getting their customers to use financial technology products by simplifying the services, ensuring the security of the services, ensuring the speed and efficiency which will aid the improvement in the activities carried out via payment system, foreign remittances and value of automated clearing thus enhancing banking sector performance.

Keywords: financial technology, banking sector, performance of deposit money banks

1. INTRODUCTION

Currently, financial institutions have witnessed tremendous breakthrough via financial technology. The embraced technology and their operations have led to seamless operations. Banks are not left out in the adoption and utilization of financial technology. Financial technology is the modernization of financial

services via innovative technology by companies or their representatives (Dorfletner, Hornuf, Schmitt & Weber, 2017). Financial technology enabled the use of FINTECH (FinTech Weekly, 2016). The banking operations aided by FINTECH covers deposit and withdrawals, clearing and settlement, credit processing, online statements of accounts, accounts opening, funds transfer, capital raising, and cards services. It also enables staff records, appraisal exercise and auditing. Financial technology enables banks in many ways like speed of service delivery, convenient banking for customers, increased profitability and market share among others.

The DMBs (commercial banks) in Nigerian banking industry invested heavily in IT products and services. DMBs FINTECH investment accounts for about 70% of the industry's total investment cost and expenditure of 46% organizational information technology in Nigeria (CBN, 2009). FINTECH success hinges on high capital investment and deliberate commitments. DMBs built private very-small-aperture-terminal (VSAT) to address communication infrastructure in Nigeria (Agboola & Salawu, 2008; Andoh-Baidoo & Osatuyi, 2009). DMBs spent $114 million annually on IT in Nigeria (Ayankotun, 2008). In 2009, the 24 commercial banks in the country spent more than $107 million US dollars on IT and related services (Ekata, 2011). This increased in 2018 through to 2020 due to growing electronic fraud (Ogbonna, Okaro & Igwe, 2021).

Financial technology in banking has led to revolution in payments systems, improved the automated clearing and truncation of cheques and deepened foreign remittance services. FINTECH facilitate reduction in cash transactions and inherent risk. Technology driven FINSERV is imminent globally in development finance (Okoye, Adetiloye, Erin & Modebe, 2016). DMBs performance in Nigeria from 2005 to 2021 showed encouraging growth (NDIC reports for 2005-2021). For instance, the industry records revealed that the ROA was 1.85% in 2005 and grew to 3.95% in 2008 representing a tremendous increase of 113.5%. It however declined steadily until 2019 and 2020 when it rose to 2.3 and 2.66 respectively, representing an increase of 15.65 %. Return on equity as a performance measure of DMBs witnessed an increase from 22.01 to 57.65 from 2005 to 2010 representing an exponential increase of 162%. It did not show any serious decline throughout the period under review. Interest income also experienced over 100% increase within the period and maintained momentum throughout the period under study. Also, non-interest income of deposit money banks increased by a huge 275.6% from 2005 to 2010. It however witnessed minimal decline but rose afterwards. With the general increase in DMBs performance measured by ROA, ROE, interest income and non-interest income, could it be said that the increase in performance resulted from the use of financial technology products? It is in the light of this that this research seeks to find out the effect of financial technology on DMBs performance in Nigeria.

The study examines financial technology effect measured by payment systems (ATM, POS and mobile banking), automated clearing and remittance services of banking sector performance in Nigeria from the period 2005 to 2020. Specifically, the study:

a. Determine the extent of effect of financial technology on ROA of DMBs in Nigeria.
b. Evaluate the extent of effect of financial technology on ROE of DMBs in Nigeria.
c. Determine the extent of effect of financial technology on interest income of DMBs in Nigeria.
d. Appraise the extent of effect of financial technology on non-interest income of DMBs in Nigeria.

Research Hypotheses

This research will be guided by the following hypotheses;

$H0_1$: Financial technology has not significantly explained the variation in ROA of DMBs in Nigeria.

$H0_2$: Financial technology has not significantly explained the variation in ROE of DMBs in Nigeria.

$H0_3$: Financial technology has not significantly explained the variation in interest income of DMBs in Nigeria.

$H0_4$: Financial technology has not significantly explained the variation in non-interest income of DMBs in Nigeria.

2. LITERATURE REVIEW

Theoretical Literature

Technology Acceptance Model

Davis, Bagozzi, and Warshaw (1989) propose the Technology Acceptance Theory (TAT) to explain the conceptual model that users' intention or acceptance degree towards information system or new technology. It models how users come to accept and use a technology. The actual system use is the end point where people use the technology. Behavioral intention is a factor that enforces technology use. This is intention influenced via attitude for technology. TAT is built on two basic foundations, notably:

i. Perceived usefulness: this refers to individual belief to improve the degree of job performance through using a particular new technology and information system.
ii. Perceived ease of use: It indicates easy of technological usage (Davis, Bagozzi & Warshaw, 1989; Gefen, Karahanna & Straub, 2003). The model places more emphasis on ease of use would positively affect perceived usefulness. Technological

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acceptance theory is based on perceptive factors (usefulness) and ease of use. TAT is widely applied on the research of information technology.

These foundations form the yardstick of theory acceptance and adoption for the study.

Empirical Review

Dauda and Akingbade (2011) studied technology innovation and Nigeria banks performance. This study looked at the assessment of employee's and customer response. One thousand nine hundred and twelve (I912) questionnaires were distributed to customers out of which one thousand six hundred and thirty-four (1634) were collected representing 85% of distributed questionnaires. One thousand four hundred and fifty-eight (1458) questionnaires were distributed to selected banks employees, out of which one thousand two hundred and twenty-three (1223) were collected representing 84% response rate. Pearson correlation coefficient was used to test the hypotheses and the result affirm technological innovation determine DMBs employee's performance, customer engagement and DMBs profitability.

Anton (2014) investigated internet banking impact on banking services in Ukraine. His research employed ordinary least square regression model for analysis. The result reveals that internet banking may be considered as a signal from a customer about being a good one. Halili (2014) carried out studies on online banking impact on DMBs performance. Data was obtained from twenty-two (22) commercial banks from UK, Germany, Czech Republic, Latvia and Poland. Pooled ordinary least square regression model was used. The study found the adoption of online banking to have negative relationship with DMBs performance indicators: ROE, ROA and margin due to global financial crisis.

Gibson (2015) examined FINTECH impact on FINSERV industry in Ireland. The study involved six (6) interviews from industry experts within the financial service industry. Using qualitative method, the result prove that FinTech is changing the traditional financial services model and impacting on the existing provider's bottom line. Michelle (2016) in his work "the effect of digital finance on FINTECH in the banking industry in Kenya" used a sample of thirteen (13) banks in Kenya out of forty-four (44). He used regression and correlation models to test the effect of digital finance on financial inclusion. The result shows that digital finance does not have any correlation on financial inclusion in banking sector in Kenya. Kemboi (2018) in his work effect of Financial technology on the performance of commercial banks in Kenya. His target population was all the forty-three (43) banks in Kenya. The study employed the multiple regression model for analysis. Findings showed that FINTECH impacted DMBs performance positively.

Maja (2018) studied FinTech negative effects on FINSERV sector, with examples from the European Union, India and the United States of America. The study was historical analysis with findings that FINTECH was inappropriate in the region which leads to negative effect on FINSERV sector. Saidi (2018) examined e-payment technology effect on bank performance in emerging economies-evidence from Nigeria. The study relied on secondary data. Analysis of data was done with time dimensional, panel least square models and sortinoindex. The study affirm that emphasis should be made on current bank resources and not previous banks performances.

Kshitika, Meena, Vinutha and Kavitha (2019) examined FinTech innovative impact on DMBs profitability. Past year profits of HDFC bank, ICICI bank, Axix bank, Kotak Mahindra bank, IDBI bank, Canara bank, Industrial bank, Bank of Maharashtra and Federal bank to find out effect after collaboration with FinTech firms. The study relied on secondary data. Paired t-test and test of normality was used for analysis. Results show that HDFC bank, Federal bank, Kotak Mahindra bank, IndusInd bank, show a profit trend in our profits. ICICI bank, Axis bank, IDBI bank, Bank of India, State bank of India, Canara bank and Bank of Maharashtra show a negative trend in their profits.

Purnomo and Khalda (2019) assessed the influence of financial technology on national financial institutions. Using descriptive methods and gathering information/data from the internet, their findings show that financial technology could hamper the development of banking. Aduaka and Awolusi (2020) evaluated electronic banking impact on Nigerian banking industry profitability. Primary and secondary data were collected through questionnaires and audited financial reports of the banks respectively. Using multiple regression, cards play a significant role more than other channels and immediately followed by ATM. It also found that e-banking channels contributed to banks' profitability. Ibekwe (2021) carried out study on financial innovation and DMBs performance in Nigeria. Using CBN data and the Augmented Dickey Fuller Test for unit roots and the OLS-regression, ATM, POS, mobile banking and internet banking have positive effect on DMBs performance.

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3. RESEARCH METHODOLOGY

3.1. Research Design

The '*ex-post facto*' research design is adopted and it is hinged on two main reasons; firstly, the study relied on historic accounting data obtained from Nigeria Inter Bank Settlement System, Central Bank of Nigeria and Nigerian Deposit Insurance Corporation, as such the event under investigation is recorded.

3.2. Model Specification

This research work adapted and modified the study of Ogbeide-Osaretin and Ishiuwu (2015) on 'empirical investigation into electronic banking impact on Nigerian economic growth'. The model is specified as follows:

RGDP = f(WB, MB, POS, ATMs)

However, our model for the study is stated thus

BSP = f(PS, FR, VAC)

Where we introduce BSP (Banking Sector Performance) which is decomposed into ROA, ROE, II and NII. Hence, the functional-model;

ROA = f(PS, FR, VAC)

ROE = f(PS, FR, VAC)

II = f(PS, FR, VAC)

NII = f(PS, FR, VAC)

This can be mathematically expressed as;

$BSP = a_0 + b_1PS_{t-1} + b_2FR + b_3VAC + e$.....1

BSP is mathematically decomposed into ROA, ROE, II and NII, thus the model is restated as follows

$ROA = a_0 + b_1PS_{t-1} + b_2FR + b_3VAC + e$.....2

$ROE = a_0 + b_1PS_{t-1} + b_2FR + b_3VAC + e$.....3

$II = a_0 + b_1PS_{t-1} + b_2FR + b_3VAC + e$.....4

$NII = a_0 + b_1PS_{t-1} + b_2FR + b_3VAC + e$.....5

Where

PS = Payment System (PS); FR = Foreign Remittances (FR); VAC = Value of Automated Clearing (VAC); ROA = Return on Assets (ROA); ROE = Return on Equity (ROE); II = Interest Income (II) and

NII = Non-Interest Income (NII).

a_0 = Constant

e = error term

b_1, b_2, b_3, b_4 = Coefficient of the explanatory variable

4. PRESENTATIONS AND INTERPRETATIONS OF FINDINGS

4.1. Data Unit Root Test Result

The unit root test was performed at level and first difference. The non-stationarity of the data at level necessitated the first difference estimation. ADF and PP test results are presented in Tables 4.1 and 4.2 respectively. The ADF and PP unit root test results indicated that all the variables were not stationary at level but all became stationary at first difference with the exception of PS that achieved stationarity at second difference of estimation via none, intercept, and trend and intercept. In overall, the data were stationary which freed them from any stationarity defect that most time series data possess.

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Table 4.1: Result of ADF Test

Variables	Intercept	Trend & Intercept	None	Inference
ROA	-5.146792 (0.00)*	-4.782743 (0.01)*	-4.110120 (0.00)*	Stationary (1/0)
ROE	-6.333822 (0.00)*	-4.452734 (0.02)**	-3.972661 (0.00)*	Stationary (1/0)
II	-3.335514 (0.03)**	-3.469947 (0.08)	-4.957793 (0.00)*	Stationary (1/1)
NII	-5.783515 (0.00)*	-5.538440 (0.00)*	-5.689138 (0.00)*	Stationary (1/1)
PS	-3.503490 (0.02)**	-3.143421 (0.14)	-3.774649 (0.00)*	Stationary (1/2)
FR	-4.297626 (0.00)*	-3.953863 (0.04)**	-3.181814 (0.00)*	Stationary (1/1)
VAC	-4.609318 (0.00)*	-1.733379 (0.67)	-0.904843 (0.30)	Stationary (1/0)

Source: E-views 10.0 version data output

Note: The optimal lag for ADF test is selected based on the Akaike Info Criteria (AIC), p-values are in parentheses where (*) & (**) denote significance at 1% and 5% respectively.

Table 4.2: Result of PP Test

Variables	Intercept	Trend & Intercept	None	Inference
ROA	-5.472384 (0.00)*	-7.094838 (0.00)*	-4.110251 (0.00)*	Stationary (1/0)
ROE	-6.818839 (0.00)*	-17.22660 (0.00)*	-3.993210 (0.00)*	Stationary (1/0)
II	-4.964076 (0.00)*	-4.903524 (0.00)*	-4.964046 (0.00)*	Stationary (1/1)
NII	-1.941816 (0.30)	-3.724921 (0.05)**	0.099716 (0.69)	Stationary (1/0)
PS	-3.453483 (0.03)**	-3.143421 (0.14)	-3.748506 (0.00)*	Stationary (1/2)
FR	-4.452543 (0.00)*	-4.163380 (0.03)**	-3.181814 (0.00)*	Stationary (1/1)
VAC	-3.173507 (0.04)**	-2.978255 (0.17)	-3.312972 (0.00)*	Stationary(1/1)

Source: E-views 10.0 version data output

Note: Spectral estimation methods are Bartlett kernel and Newey-West method for Bandwidth, p-values are in parentheses where (*) & (**) denotes significance at 1% and 5% respectively.

4.2. ARDL Co-integration Relationship

The confirmation of the stationarity of the data made way for the testing of the long run relationship between financial technology and deposit money banks performance. The result of the ARDL long run relationship is detailed in Tables 4.3 – 4.6. From the ARDL result it was observed that long run relationship exists between financial technology (payment system, foreign remittance and value of automated clearing) ROA, ROE, non-interest income. This is hinged on the values of the f-statistic of 12.76095 (Table 4.3), 19.71870 (Table 4.4), and 6.450213 (Table 4.6) are higher than the upper and lower bound test of 3.67 and 2.79 respectively. On the contrary, no co-integration relationship was found for interest income of DMBs and financial technology owing to F-statistic of 1.125656 (Table 4.5) which is less than the upper and lower bound test of 3.67 and 2.79 respectively. ECM for ROA, ROE, non-interest income, and financial technology would be estimated by that of interest income is ignored owing to the absence of the long run relationship.

Table 4.3: ARDL Bound Test for ROA → PS, FR and VAC

T-Test	5% Critical Value Bound		Remark
F-Statistic	Lower Bound	Upper Bound	
12.76095	2.79	3.67	Null Hypothesis Rejected

Source: E-views 10.0 version data output

Table 4.4: ARDL Bound Test for ROE → PS, FR and VAC

T-Test	5% Critical Value Bound		Remark
F-Statistic	Lower Bound	Upper Bound	
19.71870	2.79	3.67	Null Hypothesis Rejected

Source: E-views 10.0 version data output

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Table 4.5: ARDL Bound Test for II → PS, FR and VAC

T-Test	5% Critical Value Bound		Remark
F-Statistic	Lower Bound	Upper Bound	
1.125656	2.79	3.67	Null Hypothesis Accepted

Source: E-views 10.0 version data output

Table 4.6: ARDL Bound Test for NII → PS, FR and VAC

T-Test	5% Critical Value Bound		Remark
F-Statistic	Lower Bound	Upper Bound	
6.450213	2.79	3.67	Null Hypothesis Rejected

Source: E-views 10.0 version data output

4.3. Speed of Adjustment through ARDL ECM

When a set of variables are co-integrated, an error correction model would exist to describe the speed of short-run adjustment to equilibrium. This gives an illustration as to whether or not all the variations within the dependent variables in the model are due to co-integrating vectors attempting to return to equilibrium and the error correction term that captures these variations. The ECM in Table Tables 4.7 to 4.9 did show the expected negative sign for ROA, ROE and NII respectively. This suggests that the models do exhibit the tendency to correct. Put differently, there is significant error correction taking place through the coefficient report of -16.82%, -19.12%, and -15.40% previous period error corrected in current year for ROA, ROE, and NII respectively.

Table 4.7: Error Correction Model for ROA → PS, FR and VAC

Variables	Coefficient	Standard Error	T-Statistic	Prob.
D(PS)	-0.002719	0.003006	-0.904429	0.4006
D(FR)	1.148996	0.520777	2.206312	0.0695
D(VAC)	2.66E-07	7.11E-08	3.742548	0.0096
CointEq(-1)*	-1.682734	0.163179	-10.31219	0.0000

Source: E-views 10.0 version data output

Table 4.8: Error Correction Model for ROE → PS, FR and VAC

Variables	Coefficient	Standard Error	T-Statistic	Prob.
D(PS)	-0.008358	0.018649	-0.448202	0.6697
D(FR)	12.28082	3.159636	3.886784	0.0081
D(VAC)	1.81E-06	4.57E-07	3.960363	0.0074
CointEq(-1)*	-1.912243	0.149175	-12.81883	0.0000

Source: E-views 10.0 version data output

Table 4.9: Error Correction Model for NII → PS, FR and VAC

Variables	Coefficient	Standard Error	T-Statistic	Prob.
D(PS)	-75.82960	233.1090	-0.325297	0.7560
D(FR)	287016.9	45431.07	6.317635	0.0007
D(VAC)	-0.012443	0.004976	-2.500620	0.0465
CointEq(-1)*	-1.540188	0.210076	-7.331560	0.0003

Source: E-views 10.0 version data output

4.4. ARDL Short Run Relationship

Return on Assets and Financial Technology

The result in Table 4.10 shows the adjusted R-square value to be 0.578270, an insinuation that 57.82% changes in ROA of DMBs was due to joint variation in payment system, foreign remittance, and value of automated clearing. The F-statistic which determines if the changes in the dependent variable is significant or not, showcases that the aforementioned magnitude of changes in ROA was significantly (less than 0.05) explained by financial technology variables: payment system, foreign remittance, and value of

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automated clearing. The traditional Durbin Watson test of autocorrelation shows a value of 2.3 which implies absence of autocorrelation in the model. A revelation from the model relative statistics shows negatively insignificant relationship between ROA and payment system, while a positive insignificant relationship exists between ROA, foreign remittance and value of automated clearing. A unit increase in payment system would result in 0.02% depreciation in the ROA of DMBs, whereas a percentage appreciation in foreign remittance and value of automated clearing would lead to 114.89% and 266.0% increase in ROA of DMBs respectively. When payment system, foreign remittance and value of automated clearing are held constant, return on assets would be assumed to depreciate by 24.84.

Table 4.10 ARDL Regression for ROA → PS, FR and VAC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA(-1)	-0.682734	0.242066	-2.820445	0.0303
PS	-0.002719	0.004830	-0.562912	0.5939
PS(-1)	-0.003995	0.006617	-0.603677	0.5682
FR	1.148996	1.119966	1.025920	0.3445
FR(-1)	0.442321	1.198805	0.368968	0.7248
VAC	2.66E-07	1.30E-07	2.044022	0.0870
VAC(-1)	-4.01E-07	1.10E-07	-3.660841	0.0106
C	-24.83671	27.83390	-0.892319	0.4066
R-squared	0.805355	Mean dependent var		1.542143
Adjusted R-squared	0.578270	S.D. dependent var		3.490462
S.E. of regression	2.266733	Akaike info criterion		4.770116
Sum squared resid	30.82847	Schwarz criterion		5.135291
Log likelihood	-25.39081	Hannan-Quinn criter.		4.736312
F-statistic	3.546483	Durbin-Watson stat		2.338091
Prob (F-statistic)	0.072024			

Source: E-views 10.0 version data output

Return on Equity and Financial Technology

In table 4.11, 69.45% variation in return on equity was attributed to payment system, foreign remittance and value of automated clearing. The p-value of the F-statistic vehemently showed that financial technology was significant in explaining the changes in shareholders wealth. The Durbin Watson is 1.46, is below 2.0. The deficiency associated with this was corrected by serial correlation LM test in table 4.15. ROE showed negatively insignificant relationship with payment system, while foreign remittance and value of automated clearing is insignificantly and positively related to ROE of DMBs. Holding financial technology variables constant, return on equity would stand at -91.22%. A percentage rise in payment system would depreciate return on equity by 0.08%. However, a percentage increase in foreign remittance and value of automated clearing would lead to 122.28% and 181.0% rise in shareholders' wealth.

Table 4.11 ARDL Regression for ROE → PS, FR and VAC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROE(-1)	-0.912243	0.218566	-4.173760	0.0059
PS	-0.008358	0.029624	-0.282145	0.7873
PS(-1)	-0.044024	0.041977	-1.048773	0.3347
FR	12.28082	6.769673	1.814094	0.1196
FR(-1)	3.424293	7.558834	0.453019	0.6665
VAC	1.81E-06	8.36E-07	2.163629	0.0737
VAC(-1)	-2.39E-06	6.87E-07	-3.474099	0.0132
C	-262.8150	179.6289	-1.463100	0.1938
R-squared	0.859000	Mean dependent var		15.53500
Adjusted R-squared	0.694501	S.D. dependent var		25.11119
S.E. of regression	13.87946	Akaike info criterion		8.394256

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Sum squared resid	1155.836	Schwarz criterion	8.759432
Log likelihood	-50.75979	Hannan-Quinn criter.	8.360452
F-statistic	5.221895	Durbin-Watson stat	1.467015
Prob (F-statistic)	0.030659		

Source: E-views 10.0 version data output

Interest Income and Financial Technology

The output in Table 4.12 reveals positively insignificant relationship between payment system and interest income of DBMs, while there is insignificant negative relationship between foreign remittance, value of automated clearing, and interest income. When payment system, foreign remittance, and value of automated clearing are held constant, interest income would rise by 22.85%. A unit rise in payment system increase interest income by 1603.778, whereas a percentage increase in foreign remittance and value of automated clearing depreciate the interest income by 100626 and 0.042 respectively. The adjusted R-square shows that financial technology variables: payment system, foreign remittance, and value of automated clearing were very poor in explaining the changes in interest income as dispelled by the value of -0.00784 with f-statistic (0.985) and p-value (0.51) which is completely insignificant in statistical terms. This is to say that payment system, foreign remittance, and value of automated clearing did not significantly explained the variation in interest income of DMBs. The Durbin-Watson statistic of 2.04 provides evidence of no autocorrelation in the model.

Table 4.12 ARDL Regression for II → PS, FR and VAC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
II(-1)	0.228510	0.393903	0.580116	0.5829
PS	1603.778	2520.824	0.636212	0.5481
PS(-1)	67.93403	3152.680	0.021548	0.9835
FR	-100626.7	517044.4	-0.194619	0.8521
FR(-1)	-434588.5	457963.2	-0.948960	0.3793
VAC	-0.042048	0.048723	-0.862998	0.4213
VAC(-1)	-0.011453	0.042826	-0.267437	0.7981
C	12049031	12104680	0.995403	0.3580
R-squared	0.534842	Mean dependent var		1642783.
Adjusted R-squared	-0.007843	S.D. dependent var		1045226.
S.E. of regression	1049317.	Akaike info criterion		30.86074
Sum squared resid	6.61E+12	Schwarz criterion		31.22591
Log likelihood	-208.0252	Hannan-Quinn criter.		30.82693
F-statistic	0.985547	Durbin-Watson stat		2.041375
Prob (F-statistic)	0.515298			

Source: E-views 10.0 version data output

Non-Interest Income and Financial Technology

From the result in table 4.13, payment system and value of automated clearing have insignificant negative relationship with non-interest income. However, there exists a positive but insignificant relationship with non-interest income of DMBs. When payment system, foreign remittance, and value of automated clearing are kept at constant, non-interest income would be assumed to depreciate by 0.54. A percentage rise in payment system and value of automated clearing leads to 75.829 and 0.012443 factor decline in non-interest income.

Table 4.13 ARDL Regression for NII → PS, FR and VAC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NII(-1)	-0.540188	0.295700	-1.826810	0.1175
PS	-75.82960	394.0437	-0.192440	0.8537
PS(-1)	-727.3518	498.9494	-1.457767	0.1952
FR	287016.9	86116.11	3.332906	0.0157

FR(-1)	66773.06	83648.79	0.798255	0.4551
VAC	-0.012443	0.008193	-1.518652	0.1797
VAC(-1)	0.011563	0.007087	1.631486	0.1539
C	-6037803.	2173043.	-2.778501	0.0321
R-squared	0.846481	Mean dependent var		632593.1
Adjusted R-squared	0.667376	S.D. dependent var		300683.7
S.E. of regression	173415.1	Akaike info criterion		27.26032
Sum squared resid	1.80E+11	Schwarz criterion		27.62550
Log likelihood	-182.8223	Hannan-Quinn criter.		27.22652
F-statistic	4.726160	Durbin-Watson stat		2.571359
Prob (F-statistic)	0.038556			

Source: E-views 10.0 version data output

Nevertheless, a unit rise in foreign remittance increases the non-interest income by 287016.90. The adjusted R-squared shows that about 66.73% changes in non-interest income was significantly accounted by payment system, foreign remittance, and value of automated clearing. This is justified by the f-statistic of 7.726 and p-value of 0.038. The Durbin-Watson coefficient of 2.5 does not portray any danger of autocorrelation in the model.

4.5. Diagnostic Test

Serial Correlation LM Test

Serial Correlation LM is another test of autocorrelation which is vehemently preferred to traditional Durbin Watson, especially when a researcher feels a variable in a model may likely be correlated with another serially. The result in table 4.14 shows that the p-values of all the models are insignificant at 5% significance level, which reveal free from autocorrelation problem.

Table 4.14: B-G Serial Correlation LM Test

Models	F-statistic	Prob.
Model 1	0.184760	0.8380
Model 2	2.214738	0.2252
Model 3	2.553580	0.1929
Model 4	1.518612	0.3231

Source: E-views 10.0 version data output

Heteroskedasticity Test

The magnitude of residuals of most financial time series data appears to be related to the magnitude of recent residuals. To effectively deal with this issue, the models were checked for heteroskeasdicity via the Harvey criteria and the results summarized in table 4.15. The p-values for all the models are insignificant at 5% significance level thus, an evidence of no heteroskedasticity in the models.

Table 4.15: Heteroskedasticity Test

Models	F-statistic	Prob.
Model 1	0.467595	0.8286
Model 2	1.467466	0.3282
Model 3	13.67047	0.0693
Model 4	2.363462	0.1572

Source: E-views 10.0 version data output

Ramsey RESET Test

Table 4.16 depicts insignificant models at 5% significance level.

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Table 4.16: Ramsey Reset Specification

Models	t-statistic	df	P-value
Model 1	10.77856	(5, 1)	0.2271
Model 2	8.078603	(5, 1)	0.2607
Model 3	3.136718	(2, 4)	0.1516
Model 4	4.919722	(1, 5)	0.0773

Source: E-views 10.0 version data output

4.6. Granger Causality Test

To determine FINTECH effect on DMBs performance in Nigeria, the granger causality analysis was performed. The regression output in table 4.17 reveals value of automated clearing significantly effect ROA and ROE of DMBs owing to the unidirectional causal relationship that flows from value of automated clearing to ROA and ROE at a significant level of 5%. Unidirectional causal relationship exists between foreign remittance and non-interest income of DMBs at a significant level of 5%. The implication is that foreign remittance significantly effects on non-interest income of DMBs in Nigeria. That notwithstanding, it was divulge that non-interest income of DMBs significantly affects the value of automated clearing in Nigeria.

Table 4.17: Granger Causality Result

Null Hypothesis:	Obs	F-Statistic	Prob.	Remarks
PS does not Granger Cause ROA	14	0.63271	0.4432	No Causality
ROA does not Granger Cause PS		0.00430	0.9489	No Causality
FR does not Granger Cause ROA	15	0.08531	0.7752	No Causality
ROA does not Granger Cause FR		0.19612	0.6658	No Causality
VAC does not Granger Cause ROA	15	8.47062	0.0131	Causality
ROA does not Granger Cause VAC		1.64387	0.2240	No Causality
PS does not Granger Cause ROE	14	2.05752	0.1793	No Causality
ROE does not Granger Cause PS		0.02518	0.8768	No Causality
FR does not Granger Cause ROE	15	0.84706	0.3755	No Causality
ROE does not Granger Cause FR		0.04243	0.8403	No Causality
VAC does not Granger Cause ROE	15	10.4706	0.0071	Causality
ROE does not Granger Cause VAC		1.69374	0.2175	No Causality
PS does not Granger Cause II	14	0.24696	0.6290	No Causality
II does not Granger Cause PS		3.82210	0.0765	No Causality
FR does not Granger Cause II	15	0.33916	0.5711	No Causality
II does not Granger Cause FR		1.31931	0.2731	No Causality
VAC does not Granger Cause II	15	1.20208	0.2944	No Causality
II does not Granger Cause VAC		1.33456	0.2705	No Causality
PS does not Granger Cause NII	14	4.49344	0.0576	No Causality
NII does not Granger Cause PS		0.09182	0.7675	No Causality
FR does not Granger Cause NII	15	7.96519	0.0154	Causality
NII does not Granger Cause FR		0.00686	0.9353	No Causality
VAC does not Granger Cause NII	15	0.34832	0.5660	No Causality
NII does not Granger Cause VAC		4.91977	0.0466	Causality

Source: E-views 10.0 version data output

This is deduced on the basis of flow of causality/presence of causal unidirectional relationship between non-interest income of DMBs and value of automated clearing at a significance level of 5%.

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Table 4.18: Test of Hypotheses

Hypotheses	Equation Estimated	F-Statistic	P-Value	Decision
Hypothesis 1	ROA → PS, FR and VAC	3.546483	0.072024	Accept H_0 & Reject H_1
Hypothesis 2	ROE → PS, FR and VAC	5.221895	0.030659	Reject H_0 & Accept H_1
Hypothesis 3	II → PS, FR and VAC	0.985547	0.515298	Accept H_0 & Reject H_1
Hypothesis 4	NII → PS, FR and VAC	4.726160	0.038556	Reject H_0 & Accept H_1

Source: ARDL Output from Tables 4.14 -4.17

Table 4.18 dispels that the p-value of the F-statistic for hypothesis two, and four are significant at a significant level of 5%. This implies that financial technology variables: payment system, foreign remittance, and value of automated clearing have not significantly explained the variation in ROE and non-interest income of DMBs in Nigeria. The p-value (0.030659) and f-statistic (5.221895) for hypothesis two, and p-value (0.038556) and f-statistic (4.726160) for hypothesis four are significant at a significant level of 5% thus the null hypothesis for hypotheses two and four are rejected, while the alternate hypotheses two and four are accepted respectively. The null hypothesis for hypotheses one and three are accepted due to p-value (0.072024) and f-statistic (3.546483) for hypothesis one; p-value (0.515298) of the F-statistic (0.985547) for hypothesis three are not significant meaning the alternate hypotheses are rejected.

5. SUMMARY OF FINDINGS

FINTECH effect on banking sector performance is the main aim of this study. Specifically, the study assessed the effect of payment system, foreign remittance and value of automated clearing on ROA, ROE, II and NII of DMBs in Nigeria from 2005 to 2020. The study reveals that financial technology variables: payment system, foreign remittance, and value of automated clearing have not significantly explained the variation in return on assets of DMBs in Nigeria. Foreign remittances and value of automated clearing have positive but insignificant relationship with ROA of DMBs in Nigeria, while payment system had an insignificant negative relationship with ROA.

The variation in ROE of DMBs in Nigeria was significantly explained by financial technology variables: payment system, foreign remittance, and value of automated clearing. Foreign remittances and value of automated clearing had insignificant but positive relationship with ROE of DMBs in Nigeria, while payment system revealed an insignificantly negative relationship with ROE.

Financial technology variables: payment system, foreign remittance, and value of automated clearing have not significantly explained the fluctuation in interest income of DMBs in Nigeria. Payment system had insignificant but positive relationship with interest income, while also showing negative insignificant relationship between foreign remittances and value of automated clearing and the interest income.

The changes in non-interest income of DMBs was significantly explained by financial technology variables: payment system, foreign remittance, and value of automated clearing. Payment system and value of automated clearing have insignificant negative relationship with non-interest income of DMBs in Nigeria, while also showing foreign remittances only was able to prove positive significant relationship with non-interest income of DMBs in Nigeria.

Based on these findings, a mixed outcome in the relationship between the components of FINTECH and banking sector performance indicators was revealed. Specifically, FINTECH components and ROA, interest income have insignificant relationship while the relationship between FINTECH components and ROE, non-interest income is significant. Therefore, no holistic conclusion is reached between FINTECH components and banking sector performance indicators (ROA, ROE, II, NII) in Nigeria. Similarly, the work of Abaenewe Ogbulu and Ndugbu (2013) reports inconclusive relationship between the adoption of e-banking and DMBs performance in Nigeria. Specifically, they found a significant relationship between e-banking adoption and ROE, while a not significant relationship between adoption of e-banking and ROA was reported for Nigeria.

Affirming the position of findings, the study proffers the recommendation that the deposit money banks are encouraged to do more in getting their customers to increase the use of FINTECH products. This can be achieved by simplifying the use of the products, ensuring the security of the products, ensuring speed and product efficiency. When all these are in place, customers will have confidence in the financial technology products and will embrace it and ultimately leading to increased income.

DMBs should be prudent in spending on technology. It is unwise to keep spending heavily on financial technology services if at the end the overall contribution to performance and profitability cannot be determined. They should avoid the temptation of going into unnecessary competition with their peers in spending on financial technology services.

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The monetary and regulatory authorities should provide necessary protections to FINTECH users. They should also ensure that proper and efficient online monitoring unit exist to help reduce the fear of using financial technology products by the users. Proper monitoring and control mechanism assure improve financial technology transactions; it will attract more users which will further enhance banking sector performances.

Deposit money banks should explore other sources of revenue for profitability improvement and general performance since it has been found that financial technology alone cannot guarantee profitability and improved performance.

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Conflicts of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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