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Financial Innovations and Financial Performance of Deposit Money Banks (DMBS) In Nigeria: Ardl Approach

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Abstract: *This study examined the relationship between financial innovations (FIs) and financial performance of deposit money banks (DMBs) in Nigeria, for the periods of 2000-2021 (21years). Specifically, the study examined the effect of measures of financial innovations; Automated Teller Machine (ATM) transactions, Point of Sale (POS) transactions, Internet Banking (INTB) transactions and Mobile Banking (MB) transactions and three control variables; Interest Rate (INTR), Exchange Rate (EXCHR) and Poverty Index (PI) on the financial performance [ROE] of DMBs in Nigeria. The study made used of aggregate secondary data for all DMBs in Nigeria that will be source from CBN Statistical Bulletin, CBN Annual Report, CBN Bank Supervisory Annual Report and Nigeria Deposit Insurance Corporation (NDIC) Annual Reports for the period 2000-2020 and analyzed with Autoregressive distributed lag model having established that the model exhibited mixed integration. The findings revealed that ATM has a significant effect on ROE on the short run and long run. POS has an insignificant effect on ROE; INTB has a p-values (0.8798 and 0.8801) are higher than 5% significant level. This implies that INTB has an insignificant effect on ROE on both on the short run and long run.; MOB has an insignificant effect on ROE on both on the short run and long run; INTR has a significant effect on ROE on the short run and long run; EXCHR has an insignificant effect on ROE on the short run but significant effect on long run while PI has a significant effect on ROE on the short run and long run, though is negative.. Hence, the study concluded that financial innovation does not have significant effect on financial performance of deposit money banks in Nigeria. Therefore recommended that, Investment in financial innovations has been proven to enhance the finance of Nigerian DMBs. The banks should therefore give emphasis to efficient utilization of the financial innovations enabled services such POS, MB, ATM and INTB.*

Keywords: Finance, Innovations, Performance, Internet, Mobile

Introduction

The new Corona Virus (COVID-19) advertisement that put the world in lockdown and limited personal appearance at banks has increased online transactions. Financial innovation (FI) is expanding banking networks and services. Information and telecommunication technology underpins most financial innovations such electronic payments, loans, savings, and securities (Nwakoby, Chukwu, and Okoh, 2020).

The Nigerian financial sector is definitely digitally oriented. Financial advances have transformed the sector (Abdulmalik & Lamino, 2021). Nigerian banks are implementing new technologies to improve and streamline operations and shift from physical channels to digital and mobile delivery (PWC Nigeria, 2017). Onuoha et al. (2019) believe these financial innovations can increase aggregate income and bank efficiency. DMBs offer varied financial products and services to individuals and enterprises to improve performance. E-banking increased financial inclusion and efficiency (Motsatsi, 2017).

Unstructured Supplementary Service Data (USSD), a financial innovation adopted by Nigerian DMBs over time to improve efficiency (Onuoha et al., 2019). They boost output with specified input. They reduced cost and waste to maximise output by using low inputs. They also study and manage the organization's intake for maximum output (Jemeli and Caroline, 2019).ATMs, phone banking, Internet banking, debit cards, credit cards, agency banking, and smartcard applications are increasing rapidly in the worldwide banking sector (Ibenta and Anyanwu, 2017). Ibekwe (2021) stated that FIs comprise new financial products, new methods of delivering existing financial services, or new financial services using innovative procedures. Financial advances can go several ways.

Fast-growing innovative investments and expense output generated a market in banking, and banks' emphasis on creative as well as traditional activities has continuously expanded (Akani & Tony–Obiosa, 2020). Financial intermediaries could employ new financial products to reduce their risks after two decades of innovation in secondary markets (Kero, 2018). Numerous macroeconomic and technological changes improved the Nigerian financial sector. Due to the fall in net interest revenues in Nigeria over the past several years, banks have been trying to increase their production shares, which have benefited credit cards, telephone banking, and online banking (Akani et al., 2020). Financial innovations are one of the pillars of our financial system and essential to responsive capital markets (Davis, 2017).

Financial innovation involves launching new products, according to Noyer (2017). These definitions indicate that financial innovation requires a novel process output. Thus, financial innovation helps banks provide excellent customer service (Akani et al., 2020). FI's impact on Nigerian DMBs' financial performance is crucial. ICT growth has made FI possible and significant worldwide. FI in Nigeria has changed government, organisation, and individual banking. All parties have struggled with it. Thus, this article examines how FI affects Nigeria's DMBs' finances.

Statement of the Problem

New investments are needed as financial markets integrate and globalise, banking innovation and its repercussions have become the principal threat to banking institution deposit taking. Financial success affects company growth. Financial innovation occurs as international financial markets grow and domestic markets merge. To handle their enormous daily transactions, local financial institutions like deposit money bank have had to adopt new financial technologies. They have introduced new goods, financial institution activities, and regulatory agency strategy changes to better serve consumers. Despite these accomplishments, the financial sector has yet to realise how innovation affects financial institution growth. Lack of understanding of innovative drivers and slow bank performance evaluation may cause this.

The Central Bank of Nigeria introduced financial innovations like ATM, POS, mobile banking, internet banking, Nigeria Electronic Fund Transfer (NEFT), Nigeria Interbank Settlement System Instant Payment (NIP) transfers, and others. ICT enabled this globally. Deposit money banks invested heavily in ICT to address cashless policy issues and remain competitive.

Due to its essential role and extent, FI attracts scholarly attention. Abdulmalik and Lamino's 2021 study suggests that financial innovation (USSD) improves DMB performance in Nigeria. Internet banking, mobile banking, and ICT investments increase ROE, whereas ATM and electronic cash transfers decrease ROE, according to Esan, Ananwude, and Okeke (2020). Ibekwe (2021) found that ATM, MB, and POS have positive and large influence on ROA, but online banking has a tiny negative impact. Akwam and Yua (2021) found that mobile banking, POS, and ATMs all positively effect ROA, ROE, and EPS. Jingqin, Ying, Kaodui, and Osei-Assibey (2019) found that bank cards and ATMs, excluding POS and internet banking, increase banks' financial performance. Ibenta and Anyanwu (2017) found that efficiency ratios are negatively connected with POS and ATM transaction values, whereas web/internet and mobile banking were statistically significant. ATMs, the internet, point-of-sale systems, and mobile banking don't affect Nigeria's DMBs' efficiency ratio. Many writers' findings on FI's impact on DMBs' financial performance in Nigeria are variable and inclusive, requiring more investigation.

Thus, early research on FIs was inconsistent and used just two or three components. Mobile banking transaction closed the gap in this investigation. The report examines how ATM, POS, Internet, and mobile banking transactions affected Nigeria's DMBs' ROE from 2000 to 2020.

Review of Related Literature

Conceptual Framework
Concept of Financial Innovation (FI)

FI is usually a new financial product or technique (Nwakoby, Chukwu and Okoh, 2020). FI also involves changing a product or process. FI concepts must make markets more complete and efficient (Nwakoby, et al., 2020). Okafor (2020) defines FI as "the act of generating and then popularising new financial instruments, as well as new financial technologies, institutions, and markets." Gubler (2011) stated that FI changes financial products, intermediaries, and markets. "Hedge funds, derivatives, Islamic bonds (like Sukuk), mortgage-backed securities, retail-structured products (like ATM, POS, Agent Banking, USSD, Ebills Pay), mobile/internet banking, and the eNaira are current financial advances. Many banks have used FI to outperform DMB rivals. It can also help banks improve efficiency and market effectiveness (Kamau and Oluoch, 2017).

Some say FIs are the foundation of our financial system and the engine of responsive capital markets (Davis, 2017). Globalisation, competitiveness, multinationalism, and deregulation are shaping global banking and finance. ATMs, mobile and internet banking, debit/credit cards, POS, agency banking, Fin Techs, Payment Service Banks (PSBs), USSD, Short Message Service (SMS), Alert-Z, Partnerships with International Money Transfer Organisations (IMTOs), and Smart-card applications are rapidly transforming the global banking industry (Akwam and Yua,2022).

ICT tools and methods invented FIs. Breakthroughs in science and ICT, combined with globalisation and multinationals, have brought about great changes and novel ideas in the financial industry, resulting in remarkable financial innovations that inform new ways and ideas in banking, resulting in transactions of various dimensions and paradigms (Ibenta and Anyanwu, 2017).

Due to financial innovations, platforms for financial products and services are distributed in various banking services through less human interface, platforms, and channels (Davis, 2017). Financial innovation lowers product and service costs (Nofie, 2011). Thus, financial innovation helps banks satisfy customers and provide value to stakeholders. In this era of stiff competition and technology, "passive" firms that don't embrace change and innovation can fail (Ibekwe, 2021).

E-commerce includes ICT-based new items like e-banking. E-banking has increased financial inclusion, cashless economy, and bank efficiency worldwide (Nkem and Akujinma, 2017). DMBs in Nigeria are getting more comfortable with "branchless banking" because to mobile and internet banking (Gichungu & Oloko, 2017).It is believed that this will positively impact banks' operations, reduce overhead costs, and improve DMBs' performance in Nigeria as they optimise the opportunities created by regulation for synergy and partnerships with Telcos, PSBs, and other industry-wide players for more efficient products and service delivery for better customer experience and satisfaction (Ibenta and Anyanwu, 2017).

DMBs Performance

"DMBs performance" is a bank's trading performance over a year to meet its aims. This is particularly evident in public bank financial accounts. Commercial banks in Nigeria have recorded a constant increase in profit during the previous 10 years, notwithstanding some years with lower rates of increase. Nigerian banks are Africa's second-most profitable (Omotunde, Sunday & John-Dewole, 2017).

According to Joseph (2017), a bank's performance should start with whether it met management and investor goals. Banks have various aims. Others seem to choose a tranquil life, minimising risk and portraying a strong bank, but with little shareholder advantages. Some companies seek to grow faster and achieve long-term goals (Abaenewe, Ogbulu, & Ndugbu, 2017). Stock prices and company behaviour are supposed to represent performance. Market indicators can be inaccurate. Bank size, deposit volume, and profitability can improve performance measures. This study evaluates banks using ROA (Abaenewe, Ogbulu, & Ndugbu, 2017 and Joseph, 2017).

Theoretical Review

Innovation Diffusion Theory (IDT)

This study used Roger's 1983 invention diffusion hypothesis. This idea explains why individuals use new technologies to do old things. Relative advantage, compatibility, complexity, trialability, and observability affect an innovation's general appeal. It involves developing a new technology, approach, or imaginative use of an existing one (Kim, 2017). Technological innovation spreads through social channels through time, according to innovation diffusion. Knowledge, persuasion, decision, implementation, and confirmation are the stages of technological innovation (Kim, 2017).

The theory is relevant to the study because it underlines how financial innovations transmitted through various channels (POS, ATM, internet, and mobile) have enhanced Nigerian banks' performance by assuring efficient and effective service delivery throughout time.

Empirical Reviews

Abdulmalik and Lamino(2021) examined Nigeria's DMBs' FIs. Study design was ex-post facto. The sample size is 13 Nigerian DMBs from the study's population list. Financial statements and the 2019 CBN statistical bulletin (6-12 months) provided data. Descriptive statistics, correlation, unit root, and regression were used. DMBs efficacy is often calculated using non-parametric data envelopment analysis (DEA). After calculating the efficiency ratio, the study used multiple regressions to show that financial innovation positively and significantly impacts DMB efficiency in Nigeria (Unstructured Supplementary Service Data-USSD). Board size significantly affects DMBs in Nigeria.

Ibekwe(2021) examined how FIs influenced Nigeria's DMBs. The particular goals are to study the influence of automated teller machines, mobile and internet banking, and point of sale on Nigerian DMB performance. OLS regression was used to examine secondary data from the CBN Statistical Bulletin, Annual Report, and Statement of Accounts for 2006–2019. The study used ex-post facto research. Online banking has a slight negative influence on return on assets, but ATMs, mobile banking, and point of sale have favourable and considerable effects. Financial innovation boosts Nigerian DMBs' profitability and return on assets, according to the study. The government should build telecommunications, internet, and electrical infrastructure. Industry stakeholders must collaborate to develop this infrastructure.

Akwam and Yua (2021) examined how financial goods affected a few Nigerian DMBs in 2021. The study examined whether banks' goods in the context of strong competition affected their results. From 2010 through 2019, Nigerian Stock Exchange annual reports and fact books included secondary data. Multiple regressions analysed data. The three assumptions were evaluated and point-of-sale transactions, automated teller machines, and mobile banking all had a significant positive influence on ROE, ROA, and EPS. The

study found that DMBs should invest heavily in technology to promote financial product technologies and improve their performance in Nigeria.

Okafor (2020) examined Nigeria's deposit money banks and the cashless policy's influence on business (2009–2019). The specific goals are to examine the impact of automated teller machines, point of sale, mobile banking, and internet banking on DMBs' performance in Nigeria. Econometric approaches (OLS) included descriptive statistics, upgraded Dickey Fuller unit root tests, and ordinary least squares. ATM, POS, MB, and online banking positively impact ROA, the study found. The cashless approach improved Nigeria's DMBs, according to the report.

Research Methodology

This study used ex-post facto research. Ex-post facto research examines how past events affected the present. This study uses this research design because it is the best choice when it is impossible to choose, control, and manipulate all independent variables or when laboratory control is impractical, costly, or unethical. This study uses it because it is structured to locate, characte rise, and interpret a social phenomenon.

This study employed secondary data (time series data) from the CBN Statistical Bulletin, CBN Annual Report, CBN Bank Supervisory Annual Report, and NDIC Annual Reports from 2000 to 2020.

This study utilises Econometric Views 9.0. This statistical programme is preferred for time series data research because it produces more robust and complete results than others. This study used the unit root test, ARDL Bound Co-integration test, and ARDL Co-integrating and Long form estimation tools. While the unit root test tested whether data series are stable (i.e., if its mean and variance are time invariant and the auto-covariance does not depend on time but on the time lag between the variables), the ARDL bound cointegration test models both I(0) and I(1) variables together. After the ARDL bound cointegration test shows no cointegration between study variables, test for ARDL co-integrating and long run form. ARDL Co-integrating will examine if cointegrated variables were affected by long-run equilibrium deviations.

The model states that deposit money bank performance—proxied by Return on Equity (ROE)—is significantly influenced by technological disruptive innovations channels like ATM, POS, INTB, and MB transactions. This study includes three control variables: Interest Rate (INTR), Exchange Rate (EXCHR), and Poverty Index (PI). To match the research variables' stationarity, the updated model was ARDLed. To match the research variables' stationarity, the updated model was ARDLed. ARDL was:

$$\Delta ROE = \partial_0 + \partial_1 ROE + \partial_2 ATM_{t-1} + \partial_3 POS_{t-1} + \partial_4 INTB_{t-1} + \partial_5 MB_{t-1} + \partial_6 INTR_{t-1} + \partial_6 EXCHR_{t-1} + \partial_7 PI_{t-1} + \sum_{i=1}^{k} \gamma_1\, i\Delta ROE_{t-1} + \sum_{i=1}^{k} \gamma_2\, i\Delta ATM_{t-1} + \sum_{i=1}^{k} \gamma_3\, i\Delta POS_{t-1} + \sum_{i=1}^{k} \gamma_4\, i\Delta INTB_{t-1} + \sum_{i=1}^{k} \gamma_5\, i\Delta MB_{t-1} + \sum_{i=1}^{k} \gamma_6\, i\Delta INTR_{t-1} + \sum_{i=1}^{k} \gamma_7\, i\Delta EXCHR_{t-1} + \sum_{i=1}^{k} \gamma_8\, i\Delta PI_{t-1} + \varepsilon_t \text{ -----------} 1$$

K = lag length for the Unrestricted Error-Correction Model (UECM)

Δ = first differencing operator

ε = white noise or disturbance error term

The co-integrating long-run relationship will estimated using the specification below:

$$\Delta ROE = \partial_0 + \partial_1 ROE_{t-1} + \partial_2 ATM_{t-1} + \partial_3 POS_{t-1} + \partial_4 INTB_{t-1} + \partial_5 MB_{t-1} + \partial_6 INTR_{t-1} + \partial_7 EXCHR_{t-1} + \partial_8 PI_{t-1} + \varepsilon_t \ldots\ldots 2$$

The short-run dynamic model is specify thus:

$$\Delta ROE = \sum_{i=1}^{k} \gamma_1\, i\Delta ROE_{t-1} + \sum_{i=1}^{k} \gamma_2\, i\Delta ATM + \sum_{i=1}^{k} \gamma_3\, i\Delta POS_{t-1} + \sum_{i=1}^{k} \gamma_4\, i\Delta INTB_{t-1} + \sum_{i=1}^{k} \gamma_5\, i\Delta MB_{t-1} + \sum_{i=1}^{k} \gamma_6\, i\Delta INTR_{t-1} + \sum_{i=1}^{k} \gamma_7\, i\Delta EXCHR_{t-1} + \sum_{i=1}^{k} \gamma_7\, i\Delta PI_{t-1} + \varepsilon c_t \quad ----------3$$

Where;

εc_{t-1}= the error correction term lagged for one period

^{y}= the coefficient for measuring speed of adjustment in equation (3)

Result Discussions

The descriptive statistics accounts for the mean, minimum, maximum value, and Std. Dev. value for the measures of financial innovations, namely; ATM, POS, INTB, MOB, INTR, EXCHR and PI while FP [proxied with ROE] of DMBs in Nigeria. The result is presented below:

Table 4.2: Summary of Statistics

	ROE	**ATM**	**POS**	**INTB**	**MB**	**INTR**	**EXCHR**	**PI**
Mean	25.46810	1981.699	459.3900	104.8576	532.5971	17.59052	178.7548	17.57619
Median	22.01000	548.6000	12.72000	44.30000	6.650000	17.26000	150.2980	17.60000
Maximum	60.07000	6512.610	3204.750	675.9200	5080.960	24.85000	358.8108	27.80000
Minimum	0.270000	5.420000	2.100000	9.870000	1.010000	12.32000	102.1052	9.300000
Std. Dev.	15.90343	2399.292	867.5225	166.4513	1172.504	2.401228	77.42956	5.921309
Observations	21	21	21	21	21	21	21	21

Source: Econometric Views Version 9.0 Output (2022)

Given the series' huge maximum and minimum values, Table 4.2 shows significant variables. Descriptive statistics showed the study variables covered 21 years (2000–2021). Again, ROE reported an average and Std. Dev. of 25.4681 and 15.9034, indicating a large variance from the mean. Throughout the trial, ROE ranged from 0.2700 to 60.0700. ATM also had an average and standard deviation of 1981.699 and 2399.29, indicating that it was close to the mean. ATM values ranged from 548.6000 to 6512.610 during the research. Further, POS reported an average and Std. Dev. of 459.3900 and 867.5225, showing it was close to the norm. POS reported ranged from 3204.750 to 12.7200 during the trial. Further, INTB reported an average and Std. Dev. of 104.8576 and 166.4513, showing POS was close to the mean. POS recorded ranged from 9.8700 to 675.9200 during the trial. MB reported an average and Std. Dev. of 532.5971 and 1172.504, showing it did not differ from the mean. During the trial, MB reported 1.0100 and 5080.960. INTR also reported an average and Std. Dev. of 17.5905 and 2.4012, indicating a large departure from the mean. INTR recorded a minimum of 12.3200 and a high of 24.8500 during the research. EXCHR also had an average and Std. Dev. of 178.7548 and 77.4296, indicating a large departure from the mean. EXCHR reported 102.1052 and 358.8108 during the research. Finally, PI reported an average and Std. Dev. of 17.5762 and 5.9213, indicating that Std. Dev. is bigger than mean. PI recorded ranged from 9.3000 to 27.8000 during the study.

Correlation Matrix

Correlation matrix shows how strongly study variables are related. It also accounts for study variables' positive, negative, or zero relationships. Correlation matrix:

Table 4.3: Correlation Matrix

	ROE	ATM	POS	INTB	MB	INTR	EXCHR	PI
ROE	1.000000							
ATM	-0.313714	1.000000						
POS	-0.168477	0.838536	1.000000					
INTB	-0.119320	0.772809	0.923134	1.000000				
MB	-0.135353	0.714291	0.950064	0.799854	1.000000			
INTR	0.419441	-0.238212	-0.194632	-0.078699	-0.269747	1.000000		
EXCHR	-0.340212	0.787336	0.807643	0.716826	0.728236	-0.416207	1.000000	

PI	0.365356	-0.740417	-0.354241	-0.341435	-0.244661	0.380639	-0.458112	1.000000

Source: Econometric Views Version 9.0 Output (2022)

ATM, POS, INTB, MOB, EXCHR, and PI had a negative link with Nigerian DMB ROE, whereas INTR had a favourable correlation. INTR revealed a coefficient value of 0.4194, indicating a substantial, positive association between INTR and DMB ROE in Nigeria. The remaining variables have poor correlation. The table illustrates that multi-collinearity is unlikely. However, another test will confirm this situation.

Multi-Collinearity Test

The multicolinearity test checks for multicollinearity among study variables. The result:

Table 4.4: Multi-collinearity Test

Variables	Variance Inflation Factor (VIF)	Tolerance Value
ATM	0.096114	1.382985
POS	0.000101	3.395618
INTB	0.003808	7.123643
MB	0.011959	9.176307
INTR	0.000552	5.453496
EXCHR	0.456357	2.954712
PI	0.016386	5.654730

Source: Econometric Views Version 9.0 Output (2022)

The tolerance levels of ATM, POS, INTB, MB, EXCHR, and PI are 0.0961, 0.0001, 0.0038, 0.0120, 0.0006, 0.4564, and 0.0.0164, respectively, indicating that 9.61%, 0.01%, 0.38%, 1.20%, 0.06%, 45.64%, and 1.64% of the predictor variables' variance is not predicted by other predictors. They have tolerance values more than 0.10 and VIF less than 10. This disproves multi-collinearity.

Data Validity Test

The LM test and Heteroskedasticity Test were used to validate the data for analysis since they were time series data from 2000 to 2021. Table 4.4.1 shows this;

Table 4.4.1: Data Validity Test

Table 4.4.1a: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.146881	Prob. F(2,7)	0.3708
Obs*R-squared	4.689327	Prob. Chi-Square(2)	0.0959

Source: E-VIEW, 9.0 Outputs, 2022.

Residuals were checked for serial correlation before estimating the models. Serial correlation LM was used. The serial correlation LM test in Table 4.4.1a shows that the models have no serial correlation because the p-values of the f-statistics are insignificant at 5%.

Table 4.4.1b: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.410561	Prob. F(9,9)	0.3083
Obs*R-squared	11.11802	Prob. Chi-Square(9)	0.2677
Scaled explained SS	0.852370	Prob. Chi-Square(9)	0.9997

Source: E-VIEW, 9.0 Outputs, 2022.

Heteroskedasticity occurs when a variable's variability is unequal across a second variable's values that predict it. The Breusch-Pagan-Godfrey heteroskedasticity test ensured model estimation homoscedasticity. The models have no heteroskedasticity because the f-statistics p-values are insignificant at 5% significance level. From the table above, the chi-square P-value was 0.0764. Since it is not significant at 5%, this proves the study lacks heteroskedasticity. Thus, the residuals have no constant variance and zero mean null hypothesis is rejected. The model is homoskedastic (equal variance). We can confidently say the model is reliable and predictive.

Augmented Dickey-Fuller (ADF) Unit Root Test

The ADF test was employed to examine time series stationary property in the study. This test avoids time series data's misleading regression. The stochastic process is stationary if there is no unit root and non-stationary if there is.

Table 4.3.5: Summary of ADF Test

ADF test at Levels				
Parameter	**ADF test statistic**	**Test critical value @ 5%**	**Prob.***	**Decision**
ROE	-3.056569	-3.020686	0.0466	Non-stationary
ATM	-4.510878	-3.040391	0.0027	Stationary
POS	-4.201883	-3.052169	0.0054	Stationary
INTB	-2.116232	-3.020686	0.2407	Non-stationary
MB	7.873137	-3.065585	1.0000	Non-stationary
INTR	-2.025713	-3.020686	0.2743	Non-stationary
EXCHR	2.992077	-3.052169	1.0000	Non-stationary
PI	-1.701593	-1.701593	0.4137	Non-stationary
ADF test at Ist Difference				
Parameter	**ADF test statistic**	**Test critical value @ 5%**	**Prob.***	**Decision**
ROE	-6.612580	-2.998064	0.0000	Stationary
ATM	--4.564414	-3.965585	0.0467	Stationary
POS	-4.546794	-3.065585	0.0030	Stationary
INTB	-4.362883	-3.040391	0.0036	Stationary
MB	-7.154385	-3.081002	0.0002	Stationary
INTR	-4.830866	-3.029970	0.0012	Stationary
EXCHR	-3.338606	-3.029970	0.0110	Stationary
PI	-4.440014	-3.040391	0.0082	Stationary

Source: Econometric Views Version 9.0 (2022)

The research series' stationarity is shown in the table above. The ADF test revealed all series except ATM, MOB, EXCHR, PI, and ROE stationary at levels. ATM, POS, INTB, MOB, INTR, EXCHR, PI, and ROE reached stationarity at first difference when subjected further. All series reached stationarity at level and first differencing. Since our series were stationary at levels (1(0) and first differencing (1(1)), we should analyse the long-term link between FI and DMBs FP in Nigeria.

ARDL Bound Test

If the F-statistic of bound test is higher than the lower and upper bound critical value at 5% significance level, the null hypothesis of no long run relationship is rejected. If it is lower, long run relationship is accepted. Table 4.3.6.1 shows the financial stability-microprudential factor cointegration relationship:

Table 4.3.6.1: ARDL Bounds Test

Date: 08/29/22 Time: 09:48
Sample: 2002 2020
Included observations: 19
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.290876	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.03	3.13
5%	2.32	3.5
2.5%	2.6	3.84
1%	2.96	4.26

Source: Econometric Views Version 9.0 Output (2022)

The F-statistic 6.2909 above the 5% critical values at I(0) and I(1) boundaries, thus we reject the null hypothesis and conclude that the variables have a long-term association. Thus, Nigerian DMBs FI and FP have a long-term association.

Table 4.4.1: ARDL Cointegrating And Long Run Form				
Dependent Variable: ROE				
Selected Model: ARDL(2, 0, 0, 0, 0, 0, 0, 0)				
Date: 08/29/22 Time: 09:47				
Sample: 2000 2020				
Included observations: 19				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROE(-1))	0.252628	0.188729	1.338576	0.2135
D(ATM)	-0.025749	0.008488	-3.033448	0.0142
D(POS)	0.016690	0.039967	0.417602	0.6860
D(INTB)	-0.010817	0.069505	-0.155624	0.8798
D(MB)	0.012761	0.015142	0.842773	0.4212
D(INTR)	9.027477	2.400781	3.760226	0.0045
D(EXCHR)	0.212772	0.099045	2.148237	0.0602
D(PI)	-7.165916	2.248307	-3.187250	0.0111
CointEq(-1)	-1.370538	0.259089	-5.289845	0.0005
Cointeq = ROE - (-0.0188*ATM + 0.0122*POS -0.0079*INTB + 0.0093*MB +				
6.5868*INTR + 0.1552*EXCHR -5.2285*PI -3.3800)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ATM	-0.018788	0.006689	-2.808708	0.0204
POS	0.012178	0.029643	0.410814	0.6908
INTB	-0.007892	0.050867	-0.155157	0.8801
MB	0.009311	0.010720	0.868615	0.4076
INTR	6.586812	1.695912	3.883934	0.0037
EXCHR	0.155247	0.069522	2.233050	0.0524
PI	-5.228542	1.793569	-2.915160	0.0172
C	-3.380005	26.988305	-0.125240	0.9031
R-squared	0.268913			
Durbin-Watson stat	1.648473			

Source: Econometric Views Version 9.0 Output (2022)

The Error Correction coefficient (cointEq-1) is estimated at -0.0188, meaning the model corrects its past disequilibrium at 1.88% annually. Thus, boosting financial innovation variables at 1.88% annually will improve them greatly over time. Again, Durbin Watson Statistics showed that the model is not serially linked because its value is within the accepted range.

ATM and ROE of DMBs in Nigeria

Table 4.4.1 shows that a unit increase in ATM reduces ROE by -0.0257 and -0.0188 (2.57% and 1.88%) in the short and long run, respectively. This showed that DMB ROE in Nigeria may be affected by ATM issues as banks confront them. ATM met short-term

and long-term statistical significance. ATM strongly impacts ROE in the short and long term. This contradicts Esan, Ananwude, and Okeke (2020) and Nwakoby, Chukwu, and Okoh (2020).

POS and ROE of DMBs in Nigeria

The study found that POS positively impacted ROE in the short and long term. The good finding implies that 1% increase in POS will enhance ROE by 0.0257 and 0.0122 (2.57% and 1.22%) short- and long-term. More POS shops may benefit banks in the short and long term. POS do not yet affect ROE statistically. Thus, POS only boost ROE. This result supports Nwakoby, Chukwu, and Okoh (2020) and Esan, Ananwude, and Okeke (2020) but contradicts Ibekwe (2021) and Akwam and Yua (2021).

INTB and ROE of DMBs in Nigeria

The result in table 4.4.1 above clearly evidenced that a unit rise in INTB will reduce ROE by -0.0108 and -0.0079 (1.08% and 0.79%) on the short and long run respectively. This further revealed that, the more banks are faced with INTB risks due to challenges of daily operations; it has the likelihood of affecting the ROE of DMBs in Nigeria. In terms of statistical significance, INTB did not pass the test of statistical significance on the short and long runs. This finding is in line with the findings of Nwakoby, Chukwu, and Okoh (2020) and Esan, Ananwude, and Okeke (2020) but contrary to the findings of Ibekwe(2021) and Akwam and Yua (2021).

MB and ROE of DMBs in Nigeria

The study affirmed that MB exerted positive insignificant effect on ROE on the short run and long run. The implication of the positive result is that 1% rise in MB will increase ROE by 0.0128 and 0.0093 (1.28% and 0.93%) on the short and long run respectively. Put differently, the more banks invest more in MB; it may be favourable in the short run and long run. However, in terms of statistical significant relationship, MB insignificant influences ROE of DMBs in Nigeria. Hence, we concluded that POS are only a positive driver of ROE. This result is in line with the findings of Nwakoby, Chukwu, and Okoh (2020) and Ibekwe(2021) and Akwam and Yua (2021) but contrary to the findings of Esan, Ananwude, and Okeke (2020).

INTR and ROE of DMBs in Nigeria

The regression result tested earlier affirmed that INTR exerted positive significant effect on ROE of DMBs in Nigeria both on the short and long run. The positive result is in line with the aprioiri expectation of this study. The implication of the negative result is that 1% rise in INTR will only increase ROE of DMBs in Nigeria by 9.0275 and 6.5868 in short and long run respectively. Again, it p-values are lower than 5%. Hence, we conclude that INTR in a short and long run will have positive significant effect on ROE of DMBs in Nigeria.

EXCHR and ROE of DMBs in Nigeria

The regression result tested earlier affirmed that EXCHR exerted positive insignificant effect on ROE of DMBs in Nigeria in short run but significant positive effect in a long run. The positive result is in line with the aprioiri expectation of this study. The implication of the positive result is that 1% rise in EXCHR will only increase ROE of DMBs in Nigeria by 0.2128 and 0.1552 in short and long run respectively. Again, it p-values are lower than 5% in a long run but greater than 5% in short run. Hence, we conclude that EXCHR in a short and long run will have positive effect on ROE of DMBs in Nigeria.

PI and ROE of DMBs in Nigeria

The regression result tested earlier affirmed that PI exerted negative significant effect on ROE of DMBs in Nigeria both on the short and long run. The negative result is in line with the aprioiri expectation of this study. The implication of the negative result is that 1% rise in PI will only decrease ROE of DMBs in Nigeria by -7.1659 and -5.2285 respectively. Again, it p-values are lower than 5%. Hence, we conclude that market risk in a short and long run will have negative significant effect on ROE of DMBs in Nigeria.

Conclusion

This study analysed Nigerian DMB FIs and FP from 2000 to 2021. ATM affects ROE both short-term and long-term. POS's short- and long-term p-values of 0.6860 and 0.6908 show no effect on ROE, but INTB's (0.8798 and 0.8801) are above 5%. This implies that INTB, MOB, INTR, EXCHR, and PI all have a significant effect on ROE, but PI's effect is negative. Thus, FI does not significantly affect DMBs' FI in Nigeria.

Recommendations

We suggest:

(a) Thus, it's advised that Investment in FIs has been proven to enhance the finance of Nigerian DMBs. The banks should therefore give emphasis to efficient utilization of the financial innovations enabled services such POS, MB, ATM and INTB.

(b) The banks should embark on aggressive campaign and re-orientation of clients to create awareness for the customers to patronize the facilities especially in the area of use of POS, mobile banking and so on.

(c) Finally, the study advised that the government emphasise the need for more policies to increase ATM, POS, MB, and INTB use, which has a long-term equilibrium relationship with DMBs.

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