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Gusau Journal of Accounting and Finance, Vol. 4, Issue 1, April, 2023

MODERATING EFFECT OF BANK SIZE ON THE RELATIONSHIP BETWEEN INTEREST RATE, LIQUIDITY, AND PROFITABILITY OF COMMERCIAL BANKS IN NIGERIA

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Abstract

The recurring instability of commercial banks' performance in Nigeria have triggered stakeholders to deploy efforts toward providing solutions where the desired result is yet to be achieved. Consequently, this study examined the moderating effect of bank size on the relationship between interest rate, liquidity, and performance of the banks in Nigeria. An ex-post-facto research design was adopted, where the bank-specific data were sourced from the published annual financial statements of 12 commercial banks listed on the Nigerian Stock Exchange and the macroeconomic data were extracted from the WDI database for a ten-firm-year period from 2011 to 2020. The analysis was done using the panel regression technique with the support of Stata software version 14.2. Findings on the direct effects showed a significant and negative relationship between deposit rate and performance, and both the lending rate and loan-to-deposit ratio have positive and significant relationships with performance. Meanwhile, the intervention effects showed that the bank size has positively moderated the relationship between deposit rate and performance; whereas bank size has negatively moderated the relationship between loan-to-deposit ratio and performance. Therefore, the study recommended that banks should grow their assets to enable them to achieve economies of scale and cost efficiency.

Key Words: *Bank Size; Deposit Rate; Lending Rate; Loan-to-Deposit Ratio; Return on Equity.*
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1. Introduction

The financial intermediation function performed by commercial banks is very important to the viability of every nation's socioeconomic well-being because it facilitates the transfer of funds from the surplus sector to the deficit sector of the economy for reasons of investment and consumption (Muriithi, Nasieku, & Memba, 2022; Mia, 2022). This vital function of commercial banks necessitates the need for relevant stakeholders to take all the necessary measures of ensuring their sound performance (Chen, 2022; Mohammad, 2022), as the poor performance of banks leads to a paucity of funds in the money market, deteriorating living standards, declining gross domestic product (GDP); employee disengagement in workplaces, and failure of the banking sector that could result in runs to the financial system (Tian, 2023; Islam, 2023; Miah, Uddin, & Ahmed, 2019).

Some countries across the globe have recorded poor performance of commercial banks that led to problems in their financial systems between 2005 and 2018. These include the United States of America, Germany, France, United Kingdom, China, and South Africa, among others (Lee, Wang, Thinh, & Xu, 2022; Kozak & Wierzbowska, 2022; Kanga, Murinde, & Soumaré, 2021). Regulatory authorities in those countries have rolled out several strategies to make their banking sectors more resilient to the prevailing circumstances. A case in point was the efforts of the United States Federal Reserve Bank of conducting annual stress tests on banks that have assets in excess of $100 million (McCord & Prescott, 2014), and spent $9.7 trillion on bailouts on ailing banks in October 2009 (Wong, 2009). The United Kingdom and other European countries also spent about $2 trillion on bailouts (Mizen, 2008). Furthermore, the government of Iceland had to take loans from the International Monetary Fund (IMF) and other neighbours to save its economy (Thorhallsson & Kirby, 2012). In the same vein, the Nigerian banking consolidation of 2005 and the takeover of some ailing banks such as Skye Bank of Nigeria Plc and Diamond Bank Plc in 2018 and 2019 respectively were all spurred by poor performance (Onodi & Onuche, 2021 Soludo, 2004).

Interest rates and liquidity are some of the major determinants of commercial banks' performance (Tuna & Almahadin, 2021). The interest rate is comprised of a wide range of parameters such as interbank rate, open buyback rate, deposit rate, and lending rate, among several others. But for commercial banks, deposit and lending rates constitute the most important components of the interest rate due to their direct relationships with financial intermediation which is the core mandate of the banks. The performance of the Nigerian commercial banking subsector has recorded instabilities in both of its market-based indicators, namely the deposit and

lending rates. For instance, the average term deposit rate for 2017 rose by 2.42% to 8.60% compared to 6.18% in 2016. It further rose in 2018 by 27 basis points to 8.65%. But it dropped by 0.05% points to 8.19% in 2019 compared to 2018. Concerning the lending rate, the weighted average prime and maximum lending rates rose by 0.52% and 2.89% to 17.39% and 30.18% respectively, in 2017, compared to 16.87% and 27.29% in 2016 respectively. But the weighted average prime lending rate fell by 55 basis points to 17.0% while the maximum lending rate rose by 50 basis points to 31.15% in 2018. Furthermore, the weighted average prime lending rate fell by 1.10% to 15.07% in 2019, while the maximum lending rate rose by 0.04% to 30.56% in 2019 (CBN, 2017; 2018; 2019). This deposit and lending rates instability connotes a corresponding instability of the performance of commercial banks; and the difference between the lending rate charged against borrowers and the deposit rate paid to depositors represents the net interest income (NIM) of the banks.

Liquidity is another important determinant of performance in the commercial banking subsector. It refers to the amount of money kept by the banks to meet the withdrawal needs of depositors, and it represents the quantitative relation between a bank's total loan and its total assets expressed in percentage terms, otherwise called loan-to-deposit ratio (LDR). The CBN sets the LDR band at 30% in 2018, which was maintained in 2019. It was however raised to 35% in 2020 (CBN, 2018; 2019; 2020). The reason behind enforcing the LDR is to encourage bank lending to the real sector of the economy.

There are many empirical studies on the causes of instability in the performance of banks, which were classified as bank-specific (Utomo & Anggono, 2020), industry-specific (Oldeniel, **2020)**, and macroeconomic (Rahman, Yousaf & Tabassum, 2020). Those studies reported mixed, inconsistent, and inconclusive findings, where some found positive and significant relationships (AL-Shatnawi, Hamawandy, Sharif, Sabir-jaf, & Al-Kake, 2021); negative and significant relationships (Ahamed, 2021); insignificant positive or negative relationships (Flamini, Schumacher & McDonald, 2014).

Scholars in the field of social sciences research frown at inconsistent findings because of the wrong signals they send on the deviant behaviours of some of research variables against apriori expectations (Baron & Kenny, 1986). In such situations, Baron and Kenny advocated the use of an intervening variable called a moderator to boost the relationships between the dependent and independent variables. Going forward, some scholars argued that the introduction of a

moderating variable in a research model must be anchored on a strong theoretical backing to support the power of the moderator to change the magnitude or direction of the relationships; or to provide a better explanation of the relationships between the variables (see Memon *et al*., 2019; Aguinis, Edwards, & Bradley, 2017; Andersson, Cuervo-Cazurra, & Nielsen, 2014).

In view of the foregoing, this study employed bank size to moderate the relationship between interest rates, liquidity, and the performance of commercial banks in Nigeria. Some studies affirmed the existence of a direct relationship between bank size and bank performance because the size allows banks to spread their fixed costs over a greater asset-base, thereby reducing their average costs (Alex & Ngaba, 2018). More so, as the scale of operation increases, banks are able to improve their performance through the use of specialized inputs such as loan officers with expertise in a particular business line, resulting in greater efficiency (Parvin, Chowdhury, Siddiqua, & Ferdous, 2015). This is consistent with the basic assumptions of the resource-based view (RBV) theory of Wernerfelt (1984) which states that a firm can achieve competitive advantage and economies of scale through ownership and effective use of its assets, knowledge, capabilities, and related internal resources.

The current study also used GDP and inflation as control variables due to their established influence on bank performance. While the GDP reflects the average increase or decrease in the production of goods and services in an economy, inflation positively affects a bank's liabilities and negatively effects its assets (Ishioro, 2023) as it erodes customers' propensity to save which leads to the banks' debtors' ability to redeem their obligations (Olalere, Bin Omar, & Kamil, 2017; Zarrouk, Ben Jedidia, & Moualhi, 2016). The use of both GDP and inflation as the control variables in this work was aimed at accounting for the possible effects of those variables to cause economic instabilities that influence deposit and lending rates; as well as LDR activities.

The study further raises the main question of to what extent does bank size moderates the relationship between interest rates, liquidity, and the performance of commercial banks in Nigeria. In this context, the main objective of the study was to examine the moderating effect of bank size on the relationship between interest rates, liquidity, and the performance of commercial banks in Nigeria. Also, the financial intermediation theory was adopted to underpin this study because of its explanatory power on the basic concept of the work. The theory demonstrates how a financial intermediary (bank) assists investors (depositors) to achieve return on

investment through interest rate spread. More so, by using bank size, banks can attain economies of scale. The theory further establishes that maintaining the regulatory liquidity will enable the retention of customer deposits for effective utilization of the banks' assets to improve performance.

2. Literature Review

The performance of banks can be assessed using either non-financial or financial parameters (Eltinay & Masri, 2014). The current study adopts the financial aspect of performance, and it is operationalized to mean ROE. Saputra (2022) described ROE as the financial measure of a firm's performance in percentage terms relative to its shareholders' equity over time. The study used this as the working definition of ROE because of its relevance to the subject of the work. Moreover, Van Binsbergen, Diamond, and Grotteria (2022) defined interest rate as a fixed percentage rental amount of money charged by a lender against a borrower for a disbursed loan during a specified period to compensate for the loss or use of such financial assets. The operational meaning of interest rates for this study is deposit and lending rates. Chen, Goldstein, Huang, and Vashishtha (2022) defined a deposit rate as the amount of money *rate paid by banks on account holders' deposits.* Whereas, Wang, Zhao, and Li (2022) described a lending rate as the fixed charge made by banks against their debtors for disbursing loans to them. Both definitions were adopted for the current study. Furthermore, Mabwe and Jaffar (2022) defined liquidity as the amount of physical cash kept by banks to meet the depositors' immediate withdrawal demands. Liquidity is represented by an LDR in this study, and it represents the metric used to determine a bank's liquidity by comparing its total loans to its total deposits. In addition, Cai, Li, Lin, and Luo (2022) defined GDP as the financial worth of final goods and services produced in a nation's economy within a financial period, and this was adopted as the operational definition. However, Ridwan (2022) described inflation as the steady increase in the overall prices of goods and services in a given period, and this was also operationalized for this work. More so, bank size as the moderating variable of this study was operationalized in line with the definition by Sari, Ajija, Wasiaturrahma, and Ahmad (2022) as the total market value of a bank's assets and liabilities in terms of services, technology, equipment, branches, staff strength, products, and so on.

Scholars have conducted many empirical studies to determine the effects of deposit rate, lending rate, LDR, and bank size on the performance of commercial banks because these variables form the crux of the financial intermediation function of the banks. For instance, Gupta and Mahakud (2020) investigated the effects of

various macroeconomic, industry-specific, and bank-specific variables on the performance of 146 banks in India, from 1998-99 to 2015-2016, and reported a significant negative effect of deposit rate on performance. More so, Phan, Narayan, Rahman, and Hutabarat (2020) examined the effects of improvement in financial technology (FinTech) on banks' performance, using 41 banks in Indonesia, and found that the deposit rate otherwise called funding cost had a negative and insignificant effect on performance.

In a study, Siddique, Khan, and Khan (2021) investigated the influence of credit risk management and bank-specific factors on the performance of commercial banks from 2009 to 2018 by using data from 10 banks in Pakistan and 9 banks in India, and found a significant and negative relationship between the lending rate and performance. Katusiime (2021) examined the effect of the COVID-19 pandemic on the performance of banks in Uganda from Q1 2000 to Q1 2021, using autoregressive distributed lag (ARDL) for analysis, and established a significant and positive effect of lending rate on performance. Furthermore, Abrar (2019) explored the relationship between the lending rate and the financial and social performance of microfinance institutions (MFIs), using data from 382 5-star MFIs in 70 countries across six regions of the world from 2006 to 2012, and discovered a significant positive relationship between the lending rate and performance. Awoyemi and Jabar (2014) used data from the CBN statistical bulletin to study the relationships between the prime lending rate and the performance of microfinance banks in Nigeria and established a significant negative effect of lending rate on performance.

On the other hand, Huong, Nga, and Oanh (2021) extracted unbalanced panel data from 171 banks in nine countries of Southeast Asia from 2004 to 2016 and found a significant and positive effect of LDR on performance. More so, Nugraha, Yahya, Nariswari, Salsabila, and Octaviantika (2021) assessed the effect of NPLs, education diversity, and LDR on the performance of 41 listed banks in Indonesia between 2015 and 2019, and established a positive and significant relationship of LDR on performance. Similarly, Saleh and Winarso (2021) explored the influence of NPL and LDR on the performance of 29 banks in Bandung city of Indonesia from 2014 to 2019, and found a significant and positive effect of LDR on profitability. However, Inggawati, Lusy, Hermanto (2018) evaluated the effect of LDR, BOPO, and NPL on the profitability of 56 banks in Indonesia, and found that LDR had a significant negative effect on profitability. Also, Anggari and Dana (2020) investigated the effect of CAR, third-party funds, LDR, and bank size on

the profitability of 44 listed banks in Indonesia from 2016 to 2018 and found that LDR had a positive but insignificant effect on profitability.

On their part, Fang, Lau, Lu, Tan, and Zhang (2019) investigated the joint impacts of risk and efficiency on banks' profitability in China from 2003 to 2017, and found that bank size was significantly related to profitability. Conversely, Ibrahim (2020) examined the performance of 37 Islamic banks in Malaysia from 1997 to 1998 and found that bank size had no significant influence on performance. Meanwhile, AlFadhli and Alali (2021) investigated the effect of asset size on the performance of 10 Kuwaiti banks from 2008 to 2018 and found that the bank's asset size had a negative and significant effect on performance. However, Gupta and Mahakud (2020) examined the influence of personal characteristics of the chief executive officers on the performance of Indian commercial banks, and found that bank size had a positive and significant effect on performance. Similarly, Huong *et al.* (2021) used unbalanced data to determine the effect of liquidity risk on the performance of banks in Asia and established a positive and significant relationship between bank size and performance. But, Habtoor (2021) examined the effect of board members' shareholding on the performance of 12 banks listed on the Saudi Arabian stock exchange from 2011 to 2013 and found an inverse relationship between bank size and performance. Furthermore, Bezawada (2020) employed corporate governance practices to evaluate the influence of board characteristics on bank performance by using 34 commercial banks in India and established a negative and significant relationship between bank size and performance.

From the foregoing empirical reviews, inconsistent findings were established on the effects of deposit and lending rates, as well as bank size on bank performance, which requires the adoption of intervening variable to moderate the direct relationships. Moreover, most of the studies were conducted in European and Asian countries that have stronger socioeconomic, political, cultural, infrastructural, educational and institutional standing compared to developing countries like Nigeria, thus, the need to address the existing literature gap in this context.

Statement of Hypotheses

Based on the review of the empirical literature, the following null hypotheses were formulated:

H_{01}: Deposit rate has no significant effect on the performance of commercial banks in Nigeria.

H_{02}: Lending rate has no significant effect on the performance of commercial banks in Nigeria.

H_{03}: Loan-to-deposit ratio has no significant effect on the performance of commercial banks in Nigeria.

H_{04}: Bank Size has no significant moderating effect on the relationship between deposit rate and performance of commercial banks in Nigeria.

H_{05}: Bank Size has no significant moderating effect on the relationship between lending rate and performance of commercial banks in Nigeria.

H_{06}: Bank Size has no significant moderating effect on the relationship between Loan-to-deposit ratio and performance of commercial banks in Nigeria.

3. Methodology

The ex-pot-facto research design was used in line with Pervez, Kjell, and Roger (2020)'s suggestion because it is retrospective research that tests the hypothesized relationships among the variables. The study's population was composed of commercial 13 banks listed on the Nigerian Stock Exchange (NSE) as of 31st December 2020. However, one bank (Jaiz Bank of Nigeria Plc) was dropped because it does not operate on interest. Thus, the remaining 12 banks formed the adjusted population of the study. The justification for selecting the banks listed on the NSE was based on the availability of data. Also, a balanced panel data for a 10 firm-year period from 2011 to 2020 were used making 120 observations. The choice of this period was based on the fact that the year 2011 marked the period during which commercial banks started recuperating from the adverse performance shocks occasioned by the 2007 to 2008 global financial crisis (CBN, 2011); and 2020 was the closest year to the publication of this study. Data for the proxies of the bank-specific variables were extracted from the annual reports of the sampled banks; whereas macroeconomic data were sourced from the world development indicators (WDI). Data analysis was performed using balanced panel data regression with the aid of Stata software version 14.2. The model of the study is given by:

$$ROE_{it} = \beta_0 + \beta_1 DPR_{it} + \beta_2 LNR_{it} + \beta_3 LDR_{it} + \beta_4 GDR_{it} + \beta_4 INF_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots \quad (1)$$

$$ROE_{it} = \beta_0 + \beta_1 DPR_{it} + \beta_2 LNR_{it} + \beta_3 LDR_{it} + \beta_4 GDR_{it} + \beta_4 INF_{it} + B_5 BSZ \times DPR_{it} + \beta_6 BSZ \times LNR_{it} + \beta_6 BSZ \times LDR_{it}\, \varepsilon_{it} \quad \ldots\ldots\ldots\ldots \quad (2)$$

Where:
ROE = Return on Equity; β_0 = Intercept/Constant; $\beta_{1,2 \ldots n}$ = Parameters – Slop Coefficients; DPR = Deposit Rate; LNR = Lending Rate; BSZ = Bank Size; GDR = Gross Domestic Product Rate; ε = Error Term; $_{it}$ = Panel Data ($_i$ = cross-sectional observations; $_t$ = time series)

Measurement of Variables

The summary of the measures of the dependent, independent, moderating and control variables are presented in Table 3.1.

Table 3.1: Summary of Variables Definition and Measurement

Variables	Measures	Source	Authors	Exp. Sign.
Dependent Variable:				
Performance (ROE)	Net Income/Shareholders' Equity	BFS	Dewi *et al*. 2021	
Independent Variable:				
Deposit Rate (DPR)	Interest Paid/Total Deposits	BFS	Antoun *et al*. (2021)	-ve
Lending Rate (LNR)	Net Interest Income/Total Loans	BFS	Rahman *et al.* (2018)	+ve
Loan-to-Deposit Ratio (LDR)	Total Loans/Total Deposits	BFS	Nugraha *et al*. (2021)	+ve
Moderator:				
Bank Size (BSZ)	Natural Log of Total Assets	BFS	Tekin (2012)	+ve
Control Variable:				
Gross Domestic Prod. (GDP)	Nominal GDP Rate	WDI	Sufian & Habibullah (2009)	+ve
Inflation (INF)	Consumer Price Index (CPI)	WDI	Ridwan (2022)	-ve

Source: Authors' Compilation, 2023

Note: ROE = Return on Equity; BFS = Banks' Financial Statement; WDI= World Development Indicators.

4. Presentation of Results

The regression results obtained from the Stata software are presented in order to give room for making valid inferences from the hypotheses testing

Table 4.1: Summary of Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROE	120	0.076	0.401	-3.969	0.326
DPR	120	0.054	0.021	0.012	0.120
LNR	120	0.168	0.513	0.047	5.712
LDR	120	0.643	0.172	0.030	0.992
TA	120	1869.908	1528.338	156.510	7624.980
GDR	120	0.027	0.029	-0.018	0.067
INF	120	0.118	0.027	0.081	0.165

Note: ROE = return on equity: DPR = deposit rate; LNR = lending rate; LDR = Loan-to-Deposit Ratio; TA = total assets; GDR = gross domestic product rate; INF = Inflation

Table 4.1 reflects the descriptive statistics of 120 observations. The average ROE was 0.076 with a minimum value of -3.969, a maximum value of 0.326, and a standard deviation of 0.021. It means the average return on the shareholders' equity was 7.6%. The DPR was an average of 0.054 or 5.4% with a minimum of 0.012 or 1.2%, a maximum of 0.120 or 12%, and a standard deviation of 0.021 or 2.1%. At the same time, the average LNR was 0.168 or 16.8%, with a minimum of 0.047 or 4.7%, a maximum of 5.712 or 571%, and a standard deviation of 0.513 or 51.3%. It means the banks received an average interest income of 16.8% higher than the interest expense of 5.4%, reflecting the interest rate spread of 11.4%. But the maximum LNR coefficient of 5.712 or 571.2% was an outlier. To address this anomaly, the suggestion of Maddala (1992) was adopted where the data was checked and found to have no errors. Thus, winsorization was performed as recommended by Winsor (1946). It changed the outlier to a value closer to other values in the data. Two separate regressions were conducted with the original data and the winsorized data. Both outcomes failed to reflect significant differences, thus the natural outlier was reported,

Table 4.1 further revealed an average LDR of 0.643 or 64.3%, a minimum of 0.030 or 3%, a maximum of 0.992 or 99.2%, and a standard deviation of 0.172. Also, the GDR recorded an average value of 0.027 or 2.7%, a minimum of -0.018 or 1.8%, a maximum of 0.067 or 6.7%, and a standard deviation of 0.029. This means that during the review period, the economy recorded a GDP decline of 1.8% and a maximum increase of 6.7%. On its part, INF had an average of 0.118 or 11.8%, a minimum of 0.081 or 8.1%, a maximum of 0.162 or 16.2%, and a standard deviation of 0.027. The BSZ, as proxied by total assets (TA), had an average of

₦1869.91 billion, with a minimum of ₦156.51 billion, a maximum of ₦7624.98 billion, and a standard deviation of ₦1528.34.

Table 4.2: Correlation Matrix

	ROE	DPR	LNR	LDR	BSZ	GDR	INF
ROE	1.000						
	-						
DPR	-0.268***	1.000					
	(0.003)	-					
LNR	-0.017	0.270***	1.000				
	(0.858)	(0.003)	-				
LDR	0.152*	0.205**	-0.360***	1.000			
	(0.097)	(0.024)	(0.000)	-			
BSZ	0.351***	-0.447***	-0.256***	0.241***	1.000		
	(0.000)	(0.000)	(0.005)	(0.008)	-		
GDR	-0.099	-0.028	-0.040	-0.112	-0.224**	1.000	
	(0.283)	(0.759)	(0.663)	(0.225)	(0.014)	-	
INF	0.019	0.137	0.155*	0.107	0.112	-0.781***	1.000
	(0.841)	(0.137)	(0.091)	(0.247)	(0.223)	(0.000)	-

Note: ROE = return on equity: DPR = deposit rate; LNR = lending rate; GDR = gross domestic product rate; BSZ = bank size; values in parenthesis = probability of correlation coefficients; *** = significance level at 1%; ** = significance level at 5%; * = significance level at 10%.

Table 4.3 shows the pairwise correlation coefficients among the variables. The correlation of DPR with ROE was negative and significant (-0.268) at a 1% p-value. Whereas, the correlation of LNR and GDR with the ROE were also negative with -0.017 and -0.099 coefficients which were not significant at 0.858 and 0.283 p-values respectively. It implies that an increase in the deposit rate results in a decrease in performance and vice versa. But BSZ was positively related to ROE with a 0.351 coefficient that is significant at 1%, meaning that an increase in the assets of banks leads to an increase in the performance and vice versa. The pairwise correlation among other variables can be seen at the intersection point of the vertical and horizontal cells of each variable.

According to Cohen and Lea (2003), a high correlation coefficient insinuates an early multicollinearity signal that could only be confirmed by performing a variance inflation factor (VIF) test. Table 4.2 indicated correlation among the explanatory variables whose coefficients fall below ±0.70, which is the threshold of

multicollinearity (Hair, Anderson, Tatham & Black, 1995; Ringle, Wende & Becker, 2015).

Table 4.3: Multicollinearity Test

Variable	VIF	1/VIF
INF	2.74	0.365
GDR	2.71	0.369
DPR	1.64	0.609
BSZ	1.55	0.645
LDR	1.49	0.671
LNR	1.39	0.718
Mean VIF	1.92	

Table 4.3 has affirmed the absence of multicollinearity among the independent variables as all their VIFs were below the threshold of 10. The lowest was 1.39 and the highest was 2.74; and the mean VIF was 1.92 which was within the moderate correlation band prescribed by Hair *et al.* (1995), the highest of which is 10. This established the independence of the variables of one another, thus the model has no multicollinearity.

Table 4.4: Regression Results (Direct Relationship)

	Robust OLS		FE		RE		FGLS	
Variables	Coef.	t value	Coef.	t value	Coef.	z value	Coef.	z value
DPR	-4.946	-1.720	-4.934	-1.630	-4.946	-2.380	-4.946**	-2.450
LNR	0.160	1.620	0.144	1.550	0.160	2.040	0.160**	2.100
LDR	0.526	1.490	0.456	1.550	0.526	2.180	0.526**	2.240
BSZ	0.103	2.550	0.106	1.300	0.103	2.090	0.103	2.150
GDR	-1.597	-1.060	-1.528	-0.710	-1.597	-0.810	-1.597	-0.840
INF	-1.700	-0.930	-1.564	-0.720	-1.700	-0.820	-1.700	-0.850
Constant	-0.518	-2.190	-0.516	-0.720	-0.518	-1.080	-0.518	-1.110
R^2	0.1868		0.1860		0.1868			
Hausman	-		0.9985					
LM	0.2555							
Hetero	353.66 ***		10642.07***		-			
F-Stat	2.80		1.31		25.96		27.57	
p-value	0.014		0.258		0.000		0.000	
Obs	120		120		120		120	

Note: ROE = return on equity: DR = deposit rate; LR = lending rate; LNR = loan-to-deposit ratio; BSZ = bank size; GDR = nominal gross domestic product rate; INF = inflation rate; OLS = ordinary least square; FE = fixed effect; RE = random effect; FGLS = feasible generalized least square; Hausman = Hauman's test; Hetero = heteroscedasticity test; * = significant at 10%; ** = significant at 5%; *** = significant at 1%; Obs = number of observations.

Table 4.4 reflects the results of the OLS, FE, RE, and FGLS regressions. The OLS regression was first conducted to enable the conduct of the FE and RE regressions. Sequel to the FE and RE regressions, Hausman (1978)'s specification test was performed to select the best model for the study between the FE and RE. The null hypothesis (H_0) of Hausman's test states that the preferred model is random effects. The outcome of the Hausman's test presented in table 4.4 was not significant at a p-value of 0.9985. Therefore, the study failed to reject the null hypothesis, meaning that RE regression was the best model. To further select the fittest model between RE and OLS, Lagrange Multiplier (LM) test was conducted, whose function was to detect the presence or otherwise of serial correlation in the RE model. The null hypothesis of RE states that there is the presence of a serial correlation in the model. Because the outcome of the LM test was not significant at 0.2555 p-value, the study failed to reject the null hypothesis and concluded that the RE was inappropriate as it has a serial correlation. This implied that there was no evidence of significant differences across banks, thus simple OLS regression was selected.

Furthermore, heteroscedasticity test for the OLS model was performed. Its null hypothesis states that the residuals/errors in the model are homoscedastic. The result of the hetero test was found to be significant at 1% (0.0000 p-value) with a 353.66 coefficient. Thus, the study rejected the null hypothesis, which means that the OLS model was heteroscedastic. To correct the heteroscedasticity in the OLS, a robustness test was performed. However, after correcting the heteroscedasticity, the p-values of two of the predictor variables, LNR and LDR, deteriorated by becoming insignificant (LNR p-value: 0.107; LDR p-value: 0.139), except for DPR which became significant at 10% (a p-value of 0.085). Therefore, a feasible generalised least square (FGLS) regression was performed in line with the recommendation of Beck and Katz (1995). The FGLS is an alternative and more robust method of correcting heteroscedasticity and serial correlation in the OLS. This boosted the p-values of the deteriorating predictor variables. Thus, the FGLS was reported hereon. Table 4.4 shows the FGLS regression result, where DPR was negatively related to ROE with a -4.946 coefficient that was significant at 5% (0.014 p-value). However, LNR was positively related to ROE with a 0.160 coefficient that was significant at 5% (0.035 p-value). Also, LDR was positively related to ROE with a 0.526 coefficient that was significant at 5% (0.025 p-value).

Table 4.5: Result of Moderation Relationship (FGLS)

Variables	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
DPR	-61.434	13.987	-4.390	0.000	-88.847	-34.020
LNR	-0.007	2.127	0.000	0.997	-4.176	4.161
LDR	4.821	1.708	2.820	0.005	1.474	8.168
BSZ	0.081	0.174	0.470	0.640	-0.259	0.422
GDR	-1.692	1.856	-0.910	0.362	-5.329	1.945
INF	-1.380	1.951	-0.710	0.479	-5.203	2.443
BSZDPR	8.076	1.970	4.100	0.000	4.214	11.937
BSZLNR	0.093	0.418	0.220	0.825	-0.727	0.912
BSZLDR	-0.628	0.243	-2.580	0.010	-1.105	-0.151
Cons	-0.332	1.258	-0.260	0.792	-2.797	2.132
R^2	0.3048					
F-Stat	52.61					
p-value	0.000					
Obs	120					

Source: STATA Output (2023)

The study went further to combine all the variables in a single model to test the moderation effect. In this regard, regression procedures similar to those adopted in testing the effects of the direct relationship were followed (OLS, FE, RE, and FGLS). Since the study is more interested in the FGLS regression, its result is presented hereon in table 4.5, which reflects that BSZ had a positive moderating effect on the relationship between DPR and ROE with an 8.076 coefficient that was significant at 1% (0.000 p-value). However, BSZ failed to moderate the relationship between LNR and ROE with a 0.093 coefficient that was not significant at 0.825 p-value. But BSZ had a negative moderating effect on the relationship between LDR and ROE with a -0.628 coefficient that was statistically significant at 5% (0.010 p-value).

Table 4.6: Summary of Hypotheses Testing

Hypotheses	Relationship	z value	Coef.	p-value	Decision
H_{01}	DPR -> ROE	-2.450	-4.946**	0.014	Rejected
H_{o2}	LNR -> ROE	2.100	0.160**	0.035	Rejected
H_{03}	LDR -> ROE	2.240	0.526**	0.025	Rejected
H_{04}	BSZ*DPR -> ROE	4.100	8.076***	0.000	Rejected
H_{05}	BSZ*LNR -> ROE	0.220	0.093	0.825	Failed to Reject
H_{06}	BSZ*LDR -> ROE	-2.580	-0.628**	0.010	Rejected

Source: Compiled by the Authors (2023)

Table 4.6 shows that the regression coefficient linking DPR to ROE was negative (-4.946) and significant at a 5% level, thus, H_{01} was rejected. But the coefficient linking LNR to ROE was positive (0.160) and significant at a 5% level, thus H_{02} was rejected. However, the coefficient linking LDR to ROE was positive (0.526) and significant at a 5% level, thus H_{03} was rejected. Meanwhile, the coefficient of the moderating effect of BSZ on the relationship between DPR and ROE was positive (8.076) and significant at a 1% level, thus, H_{04} was rejected. Conversely, the coefficient of the moderating effect of BSZ on the relationship between LNR and ROE was positive (0.093) and not significant, thus, H_{05} was failed to be rejected. Whereas, the coefficient of the moderating effect of BSZ on the relationship between LDR and ROE was negative (-0.628) and significant at a 5% level, thus H_{06} was rejected.

Discussion of Findings

Table 4.4 revealed that the deposit rate is negatively related to performance at a 5% level of significance, implying that the higher the deposit rate the lower the performance because the deposit rate is an expenditure paid from the interest income earned in the review period. The table further indicates that the lending rate is positively related to performance at a 5% level of significance, meaning that the higher the lending rate the higher the performance, as the lending rate represents the interest income to the banks which improved their performance in the review period. Logically, these relationships affirmed the descriptive statistics in table 4.1 where the average lending rate was 16.8% and the average deposit rate was 5.4%, thus the interest rate spread was 11.4%. This finding corresponds to the studies that found a significant positive relationship between the lending rate and bank performance (Otiwu, 2022; Bala, Godiya, Hadith, & Maijama'a, 2022); a significant and negative relationship between deposit rate and bank performance (Brown, 2020; Caliskan & Lecuna, 2020). Table 4.6 further indicates that loan-to-deposit ratio is positively related to the performance at 5% level. This was attributable to fact that liquidity builds the confidence of depositors to maintain their accounts with the banks to enable the banks to use same for financial intermediation. This finding is consistent with that of Inshira and Jahfer (2020); Ha (2019). These findings have, therefore, corroborated the hypotheses formulated by this work and further answered the research question.

On the intervention effect, the summary of the test of hypotheses in Table 4.5 indicates that bank size has positively moderated the relationship between deposit rate and bank performance at a 5% level of significance. The point to note here is that the FGLS regression on the direct relationship between deposit rate and

performance has a -4.946 coefficient. But the introduction of a moderator in the model has changed the direction of the relationship with an 8.076 coefficient, implying that the higher the deposit rate, the higher the banks' performance because the deposit rate attracts more deposits with which the banks perform financial intermediation to earn interest rate spread.. This finding is consistent with the assumptions of the resource-based view theory of Wernerfelt (1984) which established a positive relationship between firm size and performance. It is also in tandem with the findings of Gupta and Mahakud (2020); and Huong *et al.* (2021), which affirmed a positive correlation between bank size and bank performance. Table 4.5 further indicates that bank size has negatively moderated the relationship between loan-to-deposit ratio and bank performance at a 5% level of significance. This was attributable to the liquidity risk which makes an increase in banks' assets size to create liquidity issues that could make meeting their obligations difficult. The finding was consistent with that of Habtoor (2021).

The failure of bank size to moderate the relationship between lending rate and bank performances could be attributed to the fact that the rise in bank size is accompanied by other variables that neutralize its positive effects on banks' performance. This could hold true in the case of Nigeria where there is a galloping yet artificial inflation that depreciates the value of bank assets, and widespread politically motivated insecurity that exacerbates the loss of the assets values.

5. Conclusion and Recommendation

The study established a moderating effect of bank size on the deposit rate and loan-to-deposit ratio of banks. It is therefore recommended that banks must ensure the growth of their assets in all ramifications to achieve economies of scale and cost efficiency for improved performance. Similarly, banks should tailor their deposit terms to be flexible, such that they can be renegotiated in the event of adversities like economic recessions, and to maintain and even improve their liquidity statuses above the regulator thresholds to secure depositors confidence for the sustenance of their deposits.

The policy implications of these recommendations are that, the larger the assets base of banks, the higher their ability to minimize their deposit rate burden by spreading same on other assets. Furthermore, maintaining adequate liquidity can enable banks to retain their existing customers, and to secure new customers whose deposits can be reinvested for improved performance.

Meanwhile, the limitation of the study is its failure to use additional control variables that could influence bank performance such as risk management practices, regulatory environment, and market competition. But this gives room for future researchers to address.

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