“Risk management and performance of deposit money banks in Nigeria: A re-examination”

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RISK MANAGEMENT AND PERFORMANCE OF DEPOSIT MONEY BANKS IN NIGERIA: A RE-EXAMINATION

Abstract

Risks inherent in banking businesses should be managed to prevent financial losses to the sector's stakeholders and negative externalities to the global economy. To this end, this study examines the effect of risk management on the performance of deposit money banks in Nigeria. A sample of eight (8) deposit money banks with international authorization are purposively selected out of 12 deposit money banks due to data availability. Panel data analysis techniques were adopted to analyze the secondary data that were obtained from the annual reports of banks. Findings based on the disaggregated model results reveal that both liquidity and capital risk variables exert a negative but insignificant effect on performance. However, credit risk drives performance of the internationally authorized banks positively and significantly. Furthermore, Management quality (MQ) is the only control variable that has a significant influence on the performance of the selected deposit money banks. The study concludes that credit risk and management quality significantly and positively drive performance among the financial entities.

Keywords risk management, management quality, sensitivity to market, profitability, asset quality

JEL Classification G20, G21, O16

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INTRODUCTION

The main responsibility of a bank is to collect deposits from people who have extra cash and to lend that cash at interest to people who urgently need it. The inherent dangers of the banks' performing these intermediary functions are present. The risks taken by the banks could result in unanticipated losses or in a happy outcome in the form of more income (Qudat & Alli, 2021). Risk management is essential to the financial performance of banks since it aims to reduce financial losses brought on by the intermediate functions that banks play in the economy. This is due to the possibility of banks' collapse with losses to shareholders, depositors, and the economy should there be any failure to mitigate risks related to the banks' functions.

The risks associated with the banks' intermediary roles have increased greatly, especially in recent decades as banks' diversification of asset holdings has increased (Mohammed & Knapkova, 2016; Harb et al., 2022). Besides, financial market globalization over the years, major macro-economic headwinds with the resultant negative growth, and more recently, COVID-19 outbreak consequences have subjected banks to additional financial strains for which appropriate risk management policies are needed to be deployed. The purpose of this paper is to examine the effect of credit risks, liquidity risks, capital risks and a number of control variables on the performance of the deposits'

money banks in Nigeria. These inherent risks in the operations of banks are managed with an aim of minimizing their adverse effect on banks' performance.

Previous studies on the effect of risk management on deposit banks' performance (Kolapo et al., 2012; Pakhchanyan, 2016; L. Ajayi & F. Ajayi, 2017) failed to examine all the risk factors inherent in banking businesses at both aggregate and disaggregate levels. This study therefore contributes to empirical literature by examining the effect of all the risks inherent in banking businesses at both levels. This is with a view to highlighting critical risk components that are germane to banks' performance.

1. LITERATURE REVIEW

The review of the related literature, theoretical framework and hypotheses development for the study are discussed below.

1.1. Risk management

According to the corporate finance institute, risk management refers to the method used to describe, evaluate, and prioritize risks to minimize or mitigate the risk of some types of incidents that occurred or affected the company. Risk management refers to the belief that the likelihood of an event occurring can be reduced or the consequences avoided (Zidafamor, 2016). Risk management is an important tool to mitigate the negative impact of exposure and to gain the best from risky conditions (Mohammed & Knapkova, 2016). Effective risk management is designed to reasonably ensure that the objectives of business enterprises are achieved while keeping risks associated with business activities at bay. Effective risk management regularly evaluates and detects risks, reducing surprises affecting the organization negatively. Risk management that encompasses the whole activities of business organizations is enterprise risk management.

Enterprise risk management is a mechanism carried out by an organization's board of directors, management, and other staff. It is implemented throughout the company. It is also intended to recognize possible incidents that may affect the organization negatively and manage risk to be within its risk capacity, to provide fair certainty regarding the achievement of entity objectives (Bromiley et al., 2015; Olabisi-Ayodele, & Salawu, 2021; Harb et al., 2022). Since business risks are inevitable in the operations of deposit money banks, then management of the risks will affect the sustainability and performance of the banks (Akande & Salawu, 2019; Ekinci & Poyraz, 2019).

1.2. Risk management practices in deposit money banks

The emphasis of risk management activities in the banking industry is typically on managing all the risk exposures of a banking institution and guarding the value of its assets. Banking is generally viewed as a risky enterprise, which must be judiciously managed to create and deliver value to all the stakeholders (Tursoy, 2018). Economic units typically tend to use intermediaries because of the challenges relating to asymmetric knowledge. To overcome asymmetric intelligence challenges, organizations attract specialized workers and programs, which are why units of the market have made more efficient use of the insufficient pools of funds, as a result, the funds are directed toward the most valuable activities that help the economy. However, there are certain inherent risks in the method of channeling funds from one system to another. Banks usually manage these risks as part of their regular activities. In general, banking operations create a wide range of special risks inherent in their products and activities which include banking operations, credit availment, trade financing, profit generations etc.

According to the OECD (2004), risk management practices should be incorporated fully into the overall banking system for effective implementation. Moreover, the operative application of risk management entails a holistic attitude against handling risk in each business department separately. The board's participation in setting and monitoring the risk management structure should be considered as good practice. However, the traditional corporate banking setup was devoid of enter-

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prise-wide corporate risk management practices that will manage risks in all processes. Stakeholders in the banking sector have expressed worries about the level of fraud risks and identity risks being experienced because of the fast-growing e-banking system. These are apart from risks associated with lending and other products of the banks.

One of the reform efforts by bank regulators is the initiation of the Basel Committee on Banking Supervision (BCBS) which mandated regulating banks of all member countries and the banks under their control to align their risk management practices with the stipulated prudential guidelines within a time horizon. These prudential guidelines were geared specifically towards managing operational, credit, and market risk areas, eventually facilitating reasonable measurement of risks and regulation of risk management practices along those areas.

Basel III provides global liquidity requirements to ensure banks can survive in acute stress situations with adequate, high-quality liquid capital. The provisions of Basel III are in line with Buffer's capital adequacy principle, the aim being to ensure sufficient bank capital to withstand and absorb shocks of a monetary and macroeconomic nature that are very sensitive to banking operations. In terms of risk-weighted assets, the Basel III agreement raised the banks' minimum capital levels from 2% to 4.5% of common equity. A 2.5%, buffer capital allowance is also available, which brings the general minimum requirement to 7% (BIS, 2022).

1.3. Empirical review of the literature

Okere et al. (2018) examined the effect of risk management (credit and liquidity) on financial performance of Nigerian money deposit banks. Using panel data analytical method, findings showed a positive relationship between risk management and financial performance for money deposit banks. Similarly, Adeusi and Dada (2017) used a panel regression model to analyze the effect of credit risk management on deposit money bank performance in Nigeria from 2001 to 2015. The panel analysis revealed that credit risk management has a negative relationship with deposit money banks' performance.

However, Harcourt (2017) used the over parameterized and parsimonious Error Correction Model (ECM) and Granger Causality to analyze the impact of credit risk management on the success of deposit money banks' performance in Nigeria. The CBN Statistical Bulletin, stock exchange fact books, and World Development Indicators (WDI) were used to collect data for the study, which spanned 1989 to 2014. The results show that the selected measures of credit risk management under review considerably have influence on deposit money banks' performance as evaluated by return on assets (ROA) and return on equities (ROE). The data also demonstrated a strong Granger causality relationship between the different credit risk management indicators and various performance measures.

Besides, Olajide (2017) investigated corporate governance mechanisms in the Nigerian banking sector as a risk management mechanism. They also considered the effect of corporate governance policies on the performance of Nigerian banks. In addition to the literature, a formal questionnaire was distributed to senior managers and top management personnel from 15 selected Nigerian banks. The findings revealed that enforcement is the primary challenge associated with the banking sector regulatory surveillance procedures. The findings also revealed that good corporate governance is beneficial as it enhances public confidence in Nigerian banks and the financial performance of banks.

In the value creation process of Nigerian deposit money banks, Adekunle et al. (2015) examined the role of credit risk management. The study examined the impact of antecedents such as a loan and advance loss clause, total loans and advances, non-performing loans, and total asset on accounting Equity Return (ROE) and Asset Return (ROA). Data were obtained from ten listed deposit money banks on the Nigerian Stock Exchange (NSE) between 2006 and 2010. The findings revealed that management of credit risk has a significant impact on the financial stability of commercial banks and recommended that keeping non-performing loans at a low level compared to credit allowance improves financial efficiency by increasing equity returns.

The effect of liquidity risk on banks performance using a panel data analytical technique has been investigated by Ajibike and Aremu (2015), and

Agbada and Osuji (2013). Their studies found that levels of liquidity have a positive but not substantial impact on the banks' financial performance measured with returns on equity or return on assets. The empirical findings of many of the previous studies are mixed. Besides, the studies examined risks in deposit money banks from either the perspectives of liquidity, credit, operational or markets risks without considering capital risks in banking businesses and operational risks in comparison to this study.

1.4. Theoretical framework and hypothesis development

The agency theory explains the principal-agent relationship. The agent represents the principal in a specific business agreement and is expected to serve the best interests of the principal without regard to his interests. The differences between the principal's wishes and agents might result in conflicts, as these agents do not always act in the best interest of the principal. Miscommunications and conflicts can lead to a range of corporate problems and conflicts. Interest clashes will create division within each stakeholder and generate ineffectiveness and financial losses. According to Scott (2015), agency theory is a field of game theory that examines contract designs to inspire responsible managers to function on behalf of principals. If the interests of the agent vary, this may result in a dispute with the principal.

According to Bromiley et al. (2015), the application of Enterprise Risk Management (ERM) would make a firm's initial goals more realistic and attainable. Risk management, which is the responsibility of the board of directors, is therefore one of the measures of managing conflict of interest inherent in the agent-principal relationship that exist in deposit money banks. The agents will be more circumspect in taking risks, and this will affect the sustainability and performance of the deposit money banks that are managed on behalf of the shareholders and other stakeholders.

Therefore, the following is hypothesized:

H_0: *Corporate risks management does not affect the deposit money banks' performance.*

In conclusion, interest income from loans and advances is the main source of funding for banks that accept deposits. As a result, not every loan or advance will be repaid by the borrower. The likelihood that borrowers may miss payments on their loans increases along with that likelihood (Laryea et al., 2016). To preserve the financial stability of the national economy, it is important to properly manage all risks associated with the banking industry.

2. METHOD

This study is conducted using a cross-sectional research design. This helps in achieving a better result as it helps to collect data from different banks over time, as adopted from Adekunle et al. (2015). The study's population comprises 12 deposit money banks with international authorization and quoted on the Nigerian Stock Exchange. The sample size of eight (8) deposit money banks is purposively based on their level of capital, accessibility and availability of data. A panel data technique was employed because it is the most appropriate method to explore the relationship between risk management practices and firms' performance over a period across the deposit money banks.

Secondary data were used to achieve the objective of the study. The data were obtained from audited annual reports of deposit money banks and from Central Bank of Nigeria (CBN) reports and Nigerian Deposit Insurance Corporation (NDIC) annual reports. Data obtained from these sources provide information about the financial and operational performance of the selected banks between the periods of 2008 to 2019. The data were collected on the following variables: Return on Equity (ROE), and Non-Performing Loan to total loan (NPL), Average Liquidity Ratio (ALR), and Capital Adequacy Ratio (CAR). The dependent variable for the study is firm performance measured by ROE while independent variables are NPL, ALR, CAR, and control variables.

2.1. Model specifications

Functionally, the model is specified as

$$\begin{aligned} &Bank\ Performance = \\ &= f\left(Credit\ Risk,\ Liquidity\ Risk,\right. \\ &\left.Capital\ Risk,\ Control\ variables\right), \end{aligned} \quad (1)$$

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where *Bank Performance* is measured by return on equity, and Risk management variables are represented by *Credit Risk, Liquidity Risk, Capital Risk,* and *Control Variables.*

The relationship is econometrically presented as:

$$ROE_{it} = \alpha + \beta_0 + \beta_1 NPL_{it} + \beta_2 ALR_{it} + \\ + \beta_3 CAR_{it} + \beta_4 Z_{it} + \varepsilon_{it}, \quad (2)$$

where *NPL* = Ratio of Non-Performing Loans to Total Loans (%) as a proxy for Credit Risk. *ALR* = Average liquidity ratio as a proxy for Liquidity Risk. *CAR* = Capital to Total Risk Weighted Asset Ratio (%) as a proxy for Capital Risk. Z_{it} = control variables: Capital adequacy ratios, asset quality ratio, management quality, earnings and profitability and sensitivity to market risk. ε = Stochastic error term; i = represents cross sectional dimension of the 8 banks in the sample; t = time period involved; β = Parameter of explanatory variables; α = Intercept.

2.2. Variables and definitions

Table 1. Variables and definitions

Source: Authors' compilation from previous studies.

Variables & Coding	Definitions	Equation
Dependent variable		
ROE	Return on Equity	
Independent variable		
Risk Management	A principal component index generated from capital, liquidity and credit risks	
Control variables		
Capital Adequacy Ratios		
Equity to Debt Ratio (EDR)	This is the ratio of total equity in relations to debt. It measures the capital structure of a company, degree of leverage and financial solvency at a particular point in time. This is proxied using	$EDR = \frac{Total\ Equity}{Total\ Debt} \cdot 100\%$
Equity to Total Asset Ratio (EAR)	It measures whether a company has sufficient capital to support its assets. Used in measuring the health of a firm. This is measured using	$EAR = \frac{Equity}{Total\ Asset} \cdot 100\%$
Advances to Assets Ratio (AAR)	The ratio indicates a bank's aggressiveness in lending, which always results in better profitability	$AAR = \frac{Advances}{Total\ Asset} \cdot 100\%$
Debt to Assets (DA)	This is an indicator of a company's financial leverage. It tells of the percentage of a company's total asset that were financed by creditors	$DA = \frac{Debt}{Total\ Asset} \cdot 100\%$
Capital Adequacy Ratio (CAR)	It measures the amount of a bank's core capital expressed of its risk-weighted assets	$CAR = \frac{Tier1Capital + Tier2Capital}{Risk\ weighted\ asset}$
Asset Quality Ratios		
Total Loan to Assets (TLA)	It shows the extent to which a firm has used debt to finance its asset	$TLA = \frac{Total\ Loans}{Total\ Asset} \cdot 100\%$
Non-Performing Loans to Total Loans (NLL)	This is the ratio of the amount of non-performing loans in a bank's loan portfolio in relation to the total amount of loans the bank holds	$NLL = \frac{Non-Performing\ Loans}{Total\ Loans} \cdot 100\%$
Total Investment to Total Assets (TIA)	It reveals the proportion of the asset used for investment in relation to total assets	$TIA = \frac{Total\ Investment}{Total\ Assets} \cdot 100$

3. RESULTS

The econometric approach entails the use of panel regression analysis, principal component analysis and cluster analysis.

3.1. Descriptive statistics

Table 2 shows the summary of statistics of the variables under review. It is therefore observed that on average, derivative ROE among these firms is 0.182, while the standard deviation from this value is 0.265. It was further shown that the minimum value is –0.001 with the highest of 1.219.

Capital risk reported on average is 0.680, and the standard deviation is 0.085. The least figure recorded was 0, while the maximum is 0.57. Also, liquidity risk reported on average is 0.204, and the standard deviation is 0.244. The least figure recorded is 0, while the maximum is 1.48. Credit risk among these firms is 0.073 on average while the standard deviation from this value is 0.099. It is further

Table 1 (cont.). Variables and definitions

Variables & Coding	Definitions	Equation
Control variables		
Non-Performing Loans to Total Asset (NTA)	It reveals the proportion of NPL to total assets	$NTA = \frac{Non\ Performing\ Loan}{Total\ Assets} \cdot 100\%$
Fixed Asset to Total Asset (FAS)	This is the ratio of Fixed asset in relation to the total asset	$FAS = \frac{Fixed\ Asset}{Total\ Assets} \cdot 100\%$
Management Quality		
Interest Expense to Total Expense (IEE)	This is the ratio of non-operating expenses in relation to total expenses	$IEE = \frac{Interest\ Expenses}{Total\ Expenses} \cdot 100\%$
Interest Incomes to Total Income (III)	This is the ratio of interest income in relation to total income	$III = \frac{Interest\ Income}{Total\ Income} \cdot 100\%$
Total Income to Total Expense (TIE)	This is the ratio of total expenses in relation to total incomes	$TIE = \frac{Total\ Expense}{Total\ Income} \cdot 100\%$
Operating Expenses to Asset (OEA)	This is the ratio of operating expenses in relation to total assets	$OEA = \frac{Operating\ Expenses}{Total\ Asset} \cdot 100\%$
Return on Equity (ROE)	It reveals a bank's ability to achieve return on its sources of fund to generate profit	$ROE = \frac{Profit\ after\ Tax}{Total\ Equity} \cdot 100\%$
Total Loans and Advances to Total Deposit (TAD)	This is the ratio of total loans and advances in relation to total deposits	$TAD = \frac{Total\ Advances}{Total\ Deposit} \cdot 100\%$
Interest Expenses to Deposits (IED)	This is the ratio of interest expenses in relation to total deposits	$IED = \frac{Interest\ Expense}{Deposit} \cdot 100\%$
Profit Per Employee (PPE)	This is the ratio profit after tax in relation to number of employees	$PPE = \frac{Profit\ after\ Tax}{Number\ of\ Employee}$
Earnings and Profitability		
Return on Equity (ROE)	It reveals bank's ability in achieving return on its sources of fund to generate profit	$ROE = \frac{Profit\ after\ Tax}{Total\ Equity} \cdot 100\%$
Return on Assets (ROA)	It measures how profitable and solvent the firm	$ROA = \frac{Profit\ before\ Tax}{Total\ Asset} \cdot 100\%$
Net Interest Income to Total Assets (NIA)	This earning ability of a bank at a given level of total assets. Net interest margin is the difference between the interest income and interest expenses	$NIA = \frac{Net\ Interest\ Margin}{Total\ Asset} \cdot 100\%$
Interest Income to Total Assets (ITA)	This is the ratio of interest income to total assets	$ITA = \frac{Interest\ Income}{Total\ Asset} \cdot 100\%$
Sensitivity to Market Risk		
Earnings per share (EPS)	This is the amount of income earned during a period per share of common	
Total Assets to Total Sector Asset (TAS)	Total Assets in relation to Total Assets of this sector (Deposit Money Banks in Nigeria)	
Total Deposits to Total Sector Deposits (TSD)	Total Deposits in relation to Total Deposits of this sector (Deposit Money Banks in Nigeria)	
Total Loan & Advances to Total Sector Loan & Advances (TSL)	Total Loans and Advances in relation to Total Sector Loans and Advances	
Firm Age(AGE)	The number of years the company was incorporated	
Leverage(LEV)	This is the Ratio of Total debt to Equity	

shown that the minimum value is –0.26 with the highest being 0.382. Finally, profitability has its mean value to be 0.0126, together with a deviation of 0.0398. This is followed by minimum and maximum values of –0.364 and 0.0714, respectively.

Skewness and kurtosis values were also used to test the distribution's shape. Skewness indicates the percentage of the distribution, whereas kurtosis indicates the peaks of the distribution (Pallant, 2011). A negative value indicates that the

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Table 2. Description of variables

Variables	Mean	Std. dev	Min	Max	Skewness	Kurtosis
Performance						
ROE	.182	.265	–.001	1.219	2.313	7.915
Risk Management						
Capital risk	.068	.085	0	.57	3.541	18.182
Liquidity risk	.204	.244	0	1.48	3.453	16.118
Credit risk	.073	.099	–.26	.382	–.465	5.968
Capital Adequacy Ratio						
Ear	.218	.208	.048	.999	3.286	12.529
Aar	.642	.922	.155	5.614	4.092	19.193
Da	1.455	2.003	.604	12.08	3.604	15.244
Asset Quality Ratio						
Tla	.642	.922	.155	5.614	4.092	19.193
Tia	.208	.213	0	.98	2.551	9.471
Management Quality						
Iee	.333	.148	0	.909	.694	5.819
roe 1	.096	.192	–1.337	.303	–5.074	35.964
Tad	.635	.183	.262	1.152	.206	2.812
Ied	.046	.021	0	.102	.153	3.366
Ppe	3.793	.496	2.191	4.692	–.71	3.489
Nia	.099	.198	.015	.976	3.81	15.958
Ita	.101	.077	.039	.553	4.068	20.001
Earnings and Profitability						
Lat	.203	.244	0	1.484	3.46	16.167
Lad	.23	.189	0	1.665	4.66	36.078
Sensitivity Market Risk						
Tas	.075	.042	.004	.186	.37	2.506
Tad	.635	.183	.262	1.152	.206	2.812
Tsl	.086	.048	.019	.234	.786	3.158
Lev	.783	.207	.001	.952	–3.303	12.657
Age	1.606	.288	1.255	2.093	.546	1.649

distribution is flat, whereas a positive value indicates that the distribution is peaked. According to Holmes-Smith et al. (2006), kurtosis values less than +1 or –1 are considered insignificant, values between +1 and +10 or –10 suggest mild non-normality; and values more than +10 or –10 exhibit non-normality.

The skewness and kurtosis scores in this study are positive, indicating the fundamental character of the variables examined. According to Pallant (2011), a positive or negative value does not always constitute a concern if the values are within a normal range. Moreover, the sample size influences the distribution's normalcy. A large sample size reduces the influence of non-normalcy, while small samples have an excessive impact on normality. Non-normality of the distribution did not exist, or its impacts may have been insignificant due to the small sample size of 8 banks employed in this study.

Table 3 reports the correlation analysis among the variables, which shows that profit performance (ROE) and the explanatory mix have negligible correlation, which is less than 0.8 across the relationships. Moreover, the correlation among the explanatory variables indicates the existence of highly negligible correlation. The result shows that the explanatory variables do not have more than 0.8 correlations with each other. This implies that the model was free from the problem of multicollinearity, which may understate or overstate the standard error. The correlation result also showed that all variables display considerable variation among banks, thereby justifying the use of panel estimation techniques.

Table 4 shows the result of the multivariate analysis using panel regression to estimate the effect of risk management on the performance of internationally authorized deposit money banks in Nigeria. For more robustness of the regression analysis,

Table 3. Correlation matrix

	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	ROE	1.000	–	–	–	–	–	–	–	–	–	–
(2)	Risk management (Score)	0.204	1.000	–	–	–	–	–	–	–	–	–
(3)	Capital Risk	0.043	0.272	1.000	–	–	–	–	–	–	–	–
(4)	Liquidity Risk	–0.177	–0.093	–0.169	1.000	–	–	–	–	–	–	–
(5)	Credit Risk	–0.175	0.013	–0.099	0.768	1.000	–	–	–	–	–	–
(6)	AQR	–0.149	–0.127	–0.063	0.835	0.780	1.000	–	–	–	–	–
(7)	MQ	0.245	–0.021	–0.234	–0.323	–0.337	–0.463	1.000	–	–	–	–
(8)	EP	–0.121	–0.098	–0.049	0.719	0.686	0.821	–0.578	1.000	–	–	–
(9)	SMR	0.054	0.077	–0.133	–0.277	–0.190	–0.279	–0.033	–0.197	1.000	–	–
(10)	Leverage	0.157	0.060	0.063	–0.842	–0.774	–0.873	0.545	–0.886	0.312	1.000	
(11)	Age of Banks	–0.111	–0.106	0.137	–0.128	0.004	0.059	–0.119	–0.051	0.143	0.117	1.000

Table 4. Regression estimate

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Pool OLS	Panel GLS	Pool OLS Risk Disaggregate	Panel GLS Risk Disaggregate	Panel GLS Credit risk	Panel GLS Liquidity Risk	Panel GLS Capital Risk
Liquidity Risk	–	–	–0.172	–0.172	–	–0.255	–
	–	–	(0.271)	(0.253)	–	(0.244)	–
Credit Risk	–	–	0.594	0.594***	0.668**	–	–
	–	–	(0.365)	(0.341)	(0.328)	–	–
Capital Risk	–	–	–0.207	–0.207	–	–	–0.198
	–	–	(0.321)	(0.299)	–	–	(0.302)
CAR	–0.067	–0.067	–0.067	–0.067	–0.066	–0.047	–0.058
	(0.045)	(0.042)	(0.046)	(0.043)	(0.042)	(0.042)	(0.043)
AQR	0.270	0.270	0.328	0.328	0.264	0.305	0.186
	(0.333)	(0.315)	(0.353)	(0.329)	(0.309)	(0.331)	(0.319)
MQ	0.076**	0.076**	0.076**	0.076**	0.074**	0.070**	0.066***
	(0.037)	(0.035)	(0.037)	(0.035)	(0.034)	(0.034)	(0.035)
EP	0.052	0.052	0.037	0.037	0.052	0.033	0.036
	(0.053)	(0.050)	(0.056)	(0.052)	(0.049)	(0.051)	(0.052)
SMR	0.015	0.015	0.008	0.008	0.014	0.013	0.013
	(0.033)	(0.032)	(0.035)	(0.033)	(0.030)	(0.031)	(0.033)
Leverage	0.209	0.209	0.017	0.017	0.218	–0.000	0.133
	(0.414)	(0.392)	(0.484)	(0.452)	(0.384)	(0.433)	(0.408)
Age of Banks	–0.095	–0.095	–0.097	–0.097	–0.097	–0.131	–0.125
	(0.113)	(0.107)	(0.114)	(0.107)	(0.106)	(0.106)	(0.108)
Risk Management	0.056***	0.056**	–	–	–	–	–
	(0.030)	(0.028)	–	–	–	–	–
Constant	0.185	0.185	0.356	0.356	0.133	0.458	0.301
	(0.310)	(0.293)	(0.421)	(0.393)	(0.289)	(0.355)	(0.308)
Observations	85	85	85	85	87	87	85
Number of Banks	8	8	8	8	8	8	8
R-square (between)	39	–	–	–	–	–	–

Note: Standard errors in parentheses. * p < 0.01, ** p < 0.05, *** p < 0.1. * Significance at 1%; ** significance at 5%; *** significance at 10%.

various estimators of the panel were considered. Model 1 is the pooled OLS. This is followed by the panel GLS model as captured in model 2. This is to ensure further robustness of the coefficient estimates, feasible GLS estimator was employed. More so, these models contain the index of risk management generated via principal component analysis. In addition, to understand the marginal contribution of each component of risk management, a regression model that disaggregates this impact was

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Table 5. Panel GLS model showing aggregated risk management variable

ROE	Coef.	St. err.	t-value	p-value	[95% Conf.	Interval]	Sig
Risk management	0.056	0.028	2.00	0.046	0.001	0.112	**
CARnew	–0.067	0.042	–1.59	0.112	–0.150	0.016	–
AQRnew	0.270	0.315	0.86	0.392	–0.347	0.887	–
MQnew	0.076	0.035	2.19	0.028	0.008	0.144	**
EPnew	0.052	0.050	1.04	0.300	–0.046	0.149	–
SMRnew	0.015	0.032	0.48	0.628	–0.047	0.077	–
Lev	0.209	0.392	0.53	0.594	–0.559	0.977	–
Age	–0.095	0.107	–0.88	0.377	–0.305	0.115	–
Constant	0.185	0.293	0.63	0.527	–0.389	0.759	–
Mean dependent var		0.185		SD dependent var		0.275	
Number of obs		85.000		Wald Chi-square		14.502	
Prob. > chi2		0.0696		Akaike crit. (AIC)		25.426	
R-square		0.39		–			

Note: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 6. Panel GLS model showing disaggregated risk management variable

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
liquidity risk	–0.172	0.253	–0.68	0.496	–0.668	0.324	–
credit risk	0.594	0.341	1.74	0.081	–0.074	1.261	*
CAR	–0.207	0.299	–0.69	0.488	–0.794	0.379	–
CARnew	–0.067	0.043	–1.56	0.118	–0.151	0.017	–
AQRnew	0.328	0.329	1.00	0.319	–0.317	0.973	–
MQnew	0.076	0.035	2.19	0.029	0.008	0.145	**
EPnew	0.037	0.052	0.70	0.481	–0.066	0.139	–
SMRnew	0.008	0.033	0.24	0.807	–0.056	0.072	–
Lev	0.017	0.452	0.04	0.970	–0.869	0.903	–
Age	–0.097	0.107	–0.91	0.363	–0.306	0.112	–
Constant	0.356	0.393	0.91	0.365	–0.414	1.126	–
Mean dependent var		0.185		SD dependent var		0.275	
Number of obs		85.000		Chi-square		15.452	
Prob > chi2		1.000		Akaike crit. (AIC)		28.619	
R-square		0.43		–			

Note: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table7. Panel GLS model showing credit risk effect on ROE

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
credit risk	0.668	0.328	2.04	0.042	0.026	1.310	**
CARnew	–0.066	0.042	–1.58	0.115	–0.148	0.016	–
AQRnew	0.264	0.309	0.85	0.392	–0.341	0.869	–
MQnew	0.074	0.034	2.20	0.028	0.008	0.140	**
EPnew	0.052	0.049	1.06	0.288	–0.044	0.149	–
SMRnew	0.014	0.030	0.47	0.640	–0.045	0.073	–
Lev	0.218	0.384	0.57	0.569	–0.534	0.971	–
Age	–0.097	0.106	–0.92	0.358	–0.304	0.110	–
Constant	0.133	0.289	0.46	0.645	–0.433	0.700	–
Mean dependent var		0.183		SD dependent var		0.273	
Number of obs.		87.000		Chi-square		14.818	
Prob. > chi2		1.000		Akaike crit. (AIC)		24.025	
R-square		0.51		–			

Note: *** p < 0.01, ** p < 0.05, * p < 0.1.

used (see models 3 and 4). Furthermore, each of the components was used as a proxy for risk management to gain more insights into their individual relationship with internationally authorized deposit money banks' performance.

However, for the purpose of this study, the panel GLS model (model 2 and 4) is used to explain the relationship between the focal variable (financial performance) and the explanatory mix (Risk Variables). Data analysis depicting the results of Models 2 and 4 with t-statistics and p-values are presented in Tables 5 and 6 below. Furthermore, Table 7 shows the results of the effect of credit risk on deposits money banks' performance as measured by Return on Equity (ROE).

In model 2 and Table 5, when risk management is aggregated, risk management maintains a positive and significant relationship with performance. By implication, a unit change in risk management increases performance by 5.6% ceteris paribus ($p < 1$ %,). This shows strong evidence that risk management could drive bank performance. By extension, based on the disaggregated model results in model 4 and Table 6, it can be observed that both liquidity and capital risk variables exert a negative (–0.172 and –0.207, respectively) but insignificant (p value = 0.496, and 0.488, respectively) effect on performance. However, credit risk drives performance of the internationally authorized banks positively (0.594 and 0.668) and significantly (p-value = 0.081 and p value = 0.042). By implication, credit risk is the major risk management component that explains the behavior of the bank performance by providing strong evidence for the relationship. It can also be noted that Management quality (MQ) is the only control variable, as a measure of operational risk, that has a significant influence on the performance of the selected deposit money banks. This is also consistent across all models.

Further, the Wald Chi Square test reveals a chi-square value of 14.5 and p-value of 0.0696. This reveals that the variables jointly have significant effect on internationally authorized banks performance in Nigeria. It must be noted that R-square is not a good measure of model fit in GLS (McDowell & Ferdosi, 2021). However, the R-square produced by the pooled OLS version of the model was used to explain its goodness of fit. It can therefore be noted that between the R-squared variable is 39 percent and OLS model (model 1), indicating the model can explain the variation in the dependent variable, while the remaining 61% is explained by the stochastic component of the model.

4. DISCUSSION

Capital and liquidity risks are found to be negatively related with financial performance of deposit money banks. However, the results are insignificant. This implies that capital adequacy and liquidity risks of deposit money banks affect their profitability. The capital and liquid ratios of the deposit money banks are regulated by the regulatory agency in the financial sector of the Nigerian economy. Deposit money banks must keep the statutory benchmarks of liquidity and capital adequacy ratios as prescribed by the regulator. Thus, the banks are restricted in creation of credit and advances, which consequently negatively impact their profitability. The results, however, is not significant. These findings corroborate with the findings of Ajibike and Aremu (2015), Agbada and Osuji (2013), Tassew and Hailu (2019).

Credit risk, proxied by the ratio of non-performing loan to total loan, is found to have a significant and positive effect on the financial performance of banks proxied by Return on Equity (ROE). By implication, credit risk is the major risk management component that explains the behavior of the bank performance by providing strong evidence for the relationship. Since, interest income on creation of credit facilities are the main source of income of the banks, the banks earn more income as more credit facilities are created, provided non-performing loans are minimal. The finding agrees with the findings of Kargi (2011), Al-Khouri (2011), Malik et al. (2019), but are not in line with the findings of Kithinji (2010), Olamide et al. (2015), Ekinci and Poyraz (2019).

Besides, management quality measured by management performance ratios, which proxies the operational risk is positively and significantly related to the performance of deposit money banks. Management experience and capacity in credit creation and management influence the level of profitability and financial stability of the banks. Furthermore, by implication, the composite risk measures further validate the existing link between credit risk measures of risk

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management and performance as reported in the extant literature (Otieno et al., 2016; Muriithi et al., 2017; Serwadda, 2018; Ekinci & Poyraz, 2019).

The creation of loans and advances, which imposes credit risks on deposit money banks is a major function of banks in any economy as intermediary between surplus and deficits units. Therefore, credit risks which have been found to impact profitability positively and significantly, at both the aggregate and disaggregate levels, should be managed through constructive and efficient risk management process. Hence, the null hypothesis that says risk management does not significantly affect the performance of the internationally authorized banks should be rejected. The alternate hypothesis should be accepted.

CONCLUSION

The study examines the effect of credit risks, liquidity risks, capital risks and other control variables on the performance of deposit money banks in Nigeria. The findings of this study revealed that the composite measure of risk management positively and significantly influences bank performance. Also, credit risk significantly and positively drives performance of the deposits money banks. Besides, Management quality (MQ) is the only control variable that has a significant effect on the performance of the selected deposit money banks. It is recommended, based on the results that the deposit money banks' Board and Management should ensure that appropriate procedures are in place to handle and minimize the adverse consequences of credit risk elements in its operations by improving their capacity in credit analysis, evaluations, and loan administration. Furthermore, Board appointment should be based on integrity and the quality of financial experience of members so that they can contribute meaningfully to enterprise risk management of credit risk. Finally, an effective internal control system should be maintained to monitor the risk management processes to align with credit risk management guidelines.

The study does not take into consideration the impact of COVID-19 on the performance of deposit money banks and the responsiveness of risk management committee of the deposit money banks to sudden shocks that could be occasioned by natural disasters as in the case of COVID-19. Furthermore, the sample of the population for the study consisted of eight purposively selected deposit money banks with an international presence. Hence, further studies may include other financial institutions in other African countries as a comparative study. Also, the impact of COVID-19 on credit risk management and bank performance could be evaluated.

CONFLICT OF INTEREST

There is no conflict of interest that would have influenced the outcome of the study.

AUTHOR CONTRIBUTIONS

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APPENDIX A

Table A1. Normality test of data using the Jarque-Berra test

Model	Variables	Obs	adj chi2(2)	Prob > chi2
POLS	Residual	165	1.145	0.5642

The study checked for normality of the residual as one assumption of Pooled OLS. The result indicates that in all the models, the residual is normally distributed as indicated by its insignificant p-value 0.5642, which is greater than the 5% significance level.

Table A2. Multicollinearity test

Variable	VIF	Tolerance
Lev	9.51	0.105174
AQRnew	6.08	0.164481
EPnew	5.33	0.187505
CARnew	3.06	0.326767
MQnew	1.8	0.554572
SMRnew	1.27	0.788388
Age	1.26	0.79461
Risk_mng	1.09	0.918989
Mean VIF	3.67	–

Also, the study checked for multicollinearity among the independent variable as one of the assumptions of classical linear regression. Table A2 reveals the absence of multicollinearity as the highest Variance inflation factor (VIF) is less than 10, as suggested by Men et al. (2016).

Table A3. Test for heteroskedasticity using Cameron & Trivedi's (2005) decomposition test for heteroskedasticity

Source	chi2	df	P
Heteroskedasticity	114.2	54	0.5015
Skewness	10.53	9	0.1550
Kurtosis	1.19	1	0.0451
Total	59.23	53	0.2588

The homoscedasticity of the residual is yet another result of a classical regular least square. The study used the White test that is Cameron and Trivedi's heteroskedastic test, which is superior when the error term is not normally distributed (Cameron & Trivedi, 2005; Williams & Cook, 2015). Three models (POLS, FE & PGLS) show that there is no problem of heteroskedasticity as indicated by a p-value of 0.5015, which is greater than 5%.

Table A4. Auto correlation test. Wooldridge test for autocorrelation in panel data

Statistic	Results
Fstat	0.001
Prob> chi2	0.9814

Based on the assumption of pool OLS assumption of no serial or auto correlation, the study conducted Wooldridge's test for autocorrelation in panel data with a null hypothesis that there is no first order autocorrelation at the 5% significance level. Table A4 reveals the absence of auto correlation in the model with a p-value of 0.9814.

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