

Market and Operational Risk Impact on Quoted Deposit Money Banks' Financial Performance in Nigeria: A Panel Regression Approach

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Abstract

The rising importance of market and operational risk to controlling financial risks inherent in Deposit Money Banks (DMBs) in Nigeria remains integral to their financial performances. Thus, this study assesses the impact of market and operational risk on DMB performance in Nigeria. Eight (8) years of data between 2015 and 2023 retrieved from the published annual reports of thirteen (13) DMBs were applied for this study. The analysis includes descriptive statistics and inferential statistics of correlation and panel regression for this study. The outcome of this study posits that the variables MRSK and OPSK have an impact of approximately 66%, 61%, and 65% on ROA for the pooled effect model, fixed effect model, and random effect model, respectively while their impact on EPS shows an impact of about 70%, 74% and 73% correspondingly for all the scenarios applied indicating that MRSK and OPSK are positive and negative predictors respectively. This study concluded that there has been a significant impact of both the MRSK and OPSK on EPS and ROA for the pooled, fixed and random effect model respectively for the period under review. This study recommended that management should prioritise implementing cost management measures to reduce the ratio of operating expenditures, which will ultimately result in improved profit margins. If the bank does not aggressively address recurrent modest losses in its daily operations, which are often caused by its inability to utilise its fixed costs effectively, its demise is inevitable.

Keywords

Financial Risk, Market Risk, Operational Risk, Liquidity Risk, Credit Risk, Bank Size, Financial Performance, Quoted Deposit Money Banks, Return on Assets (ROA), Nigeria

1. Introduction

The financial sector is crucial for economic development in Nigeria, with Deposit Money Banks (DMBs) playing a pivotal role in financial intermediation. As the largest economy in Africa, Nigeria's banking sector significantly influences its economic stability and growth. However, these banks face ongoing challenges, particularly liquidity, credit, market and operational risks, which impact their financial performance. Market risk encompasses the potential losses that banks may face due to fluctuations in interest rates, foreign exchange rates, and equity prices. In Nigeria, the volatility of these market variables is often exacerbated by the country's heavy reliance on oil exports, which makes the economy particularly susceptible to global commodity price shocks (Muhammed & Muhammed, 2021). For instance, the dramatic shifts in oil prices have historically led to significant devaluations of the Naira, affecting banks' foreign currency-denominated assets and liabilities. Additionally, interest rate fluctuations can impact the net interest margins of banks, while changes in stock prices can affect their investment portfolios. On the other hand, operational risk arises from internal process failures, human errors, system outages, and external events. Nigerian banks face substantial operational risks due to inadequate infrastructure, cybersecurity threats, and regulatory challenges. These risks can lead to significant financial losses, disruptions in banking operations, and reputational damage. For example, process inefficiencies and human errors can result in financial misreporting, while technological failures can disrupt banking services and erode customer trust (Muhammed & Adindu, 2023).

Risks are inherent uncertainties that are consistently present in all profit-oriented company enterprises. Financial institutions face a range of hazards, including credit risk, interest rate risk, liquidity risk, market risk, foreign exchange risk, currency risk, commodity risk, and operational risk. Banks' risks are particularly relevant (Iyinomen et al., 2020). Financial risk refers to unanticipated return fluctuations or instability (Afolabi, 2021). It encompasses credit, liquidity, and market risks, all of which contribute to the volatility of financial performance (Oudat & Ali, 2021). The hypothesis posits that inadequate management of financial risk results in the failure of financial performance. The financial crisis has reached unprecedented levels and caused lasting harm to businesses, nations, and individuals. Every business choice and entrepreneurial action is inherently linked to risk. All financial organisations share several hazards. Financial institutions, ranging from banks to microfinance organisations, face many risks. These risks include credit, liquidity, market or price, operational, compliance, legal, and strategy risks (Salaudeen et al., 2021). In their study, Hidayat et al. (2021) found that the banking sector saw a significant impact from low-quality loan assets due to unfavourable economic and financial circumstances in the nation after the Great Financial Recession of 2008 and the negative oil price shock. The limited ability to collect outstanding debts impeded banks from providing further economic credit, negatively impacting production. The establishment of the

Asset Management Corporation of Nigeria (AMCON) in 2010 was a direct reaction to address the significant issue of non-performing loans that were causing distress to commercial banks. AMCON was created as a part of the monetary policy measures to tackle this problem. In 2016, Nigeria had an economic crisis due to a decline in oil prices, underperforming financial markets, and fluctuations in interest and currency rates. The challenges of credit defaults and non-performing loans have become prominent topics in economic discussions. Risk management is crucial in financial institutions. If they had considered it, previous financial crises could have been avoided. Therefore, risk management is considered a fundamental factor for all companies in any business operation (Isibor et al., 2024).

The banking sector serves as the foundation of Nigeria's financial system. Regrettably, it is burdened with substantial credit risk, posing a danger to its existence (Eno & Iniabasi, 2022). The significant risk may have been significantly reduced by using an efficient credit management system (Ayiro et al., 2022). The inadequate assessment of the credit system has resulted in substantial financial losses for banks, to the point where their existence has been severely compromised. Consequently, several banks have been either acquired or compelled to cease operations, as shown in the CBN report 2023. According to Yinka et al. (2015), the failure of banks in Nigeria was attributed to inadequate management of resources, leading to the accumulation of non-performing loans. Banks provided unsecured loans, incentivising unscrupulous individuals to apply for loans without intention of repayment. Although many risks are beyond the banks' control, proficient management should be capable of minimising their impact on the credit system. According to Haruna (2019), banks face increased risks due to interest rate rises and volatility in the currency rate. However, banks may minimise these risks by using efficient credit assessment mechanisms.

The Naira's depreciation, driven by volatile oil prices, led to foreign exchange losses ₦200 billion in 2016 alone, severely reducing profitability. Interest rate fluctuations caused net interest margins to vary widely, with an average decline of 3% across major banks between 2017 and 2020. Operational risks, including system outages and cybersecurity breaches, resulted in financial losses and service disruptions. For example, in 2018, Nigerian banks reported an increase in non-performing loans to 14.2%, primarily due to operational failures and poor risk management, significantly impacting the sector's financial performance. The CBN has implemented several policies to mitigate market and operational risks. Key measures include exchange rate management, unification of all windows, monetary policy rate adjustments, and building foreign exchange reserves. Operational risk strategies involve strengthening regulatory frameworks, issuing cybersecurity guidelines, enhancing operational resilience through stress testing, and managing non-performing loans via the Asset Management Corporation of Nigeria (AMCON). These policies have had varying degrees of success and improved risk management and financial stability but are facing challenges such as

market distortions, evolving cyber threats, and persistent non-performing loans, necessitating ongoing adaptation and enhancement.

Due to their financial difficulties, the Federal Government of Nigeria implemented a recapitalisation programme in 2005 to bolster listed Deposit Money Banks. As a result, this action resulted in the consolidation of some banks via mergers and acquisitions to enhance the effectiveness of non-performing loans and financial performance. According to Udemebong et al. (2019), the primary reason for the failure of banks in Nigeria is non-performing loans. This occurred owing to the lack of thorough investigation and assessment of loan applicants, resulting in the allocation of money to those who misused them for purposes not intended, leading to liquidity issues. The banks' liquidity issues prompted the CBN to inject a substantial amount of around N786 billion into the banking system to bolster its liquidity, as stated in the 2023 report by the CBN. The ongoing reduction of banks' capital reserves, rise in non-performing loans, and liquidity difficulties has significantly impacted shareholders and the government, given banks' crucial role in financial intermediation. DMBs are crucial in facilitating economic progress. As intermediaries in the financial sector, they enable the movement of financial resources from entities with excess funds to those with a shortage of funds, thereby assuring the effective allocation and use of money. To consistently fulfill this vital role in the advancement of society, commercial banks must have robust corporate risk management systems to prevent the occurrence of bankruptcy, illiquidity, and ultimate collapse.

Despite extensive research on the impact of various risks on the financial performance of banks globally and within Nigeria, there remains a significant gap in the literature regarding the comprehensive effects of market and operational risks. Most existing studies focus on credit and liquidity risks or employ cross-sectional data, which may not fully capture these risks' dynamic and evolving nature over time. This study aims to fill this gap by employing a panel regression approach to analyze the impact of market and operational risks on the financial performance of quoted Nigerian DMBs from 2015 to 2023. Again, the analysis of existing literature has identified many gaps that the present research aims to address. Several research, such as those done by Wijekoon and Jameel (2021), Safitri et al. (2021), Nguyen (2020), Sebayang (2020), Dao and Nguyen (2020), and others, have a geographical limitation since they were not carried out in Nigeria. Consequently, the findings may not be relevant in Nigeria due to the contrasting socio-economic conditions between Nigeria and other nations. Against this backdrop, this study seeks to examine the relationship between credit risk management and the financial performance of quoted deposit money banks across two West African Countries. The specific objectives are to:

- 1) Examine the effect of market risk on the financial performance of quoted deposit money banks in Nigeria.
- 2) Determine the effect of operational risk on the financial performance of quoted deposit money banks in Nigeria.

2. Literature Review

2.1. Market Risk

Market risk pertains to the potential for financial loss caused by fluctuations in market prices, sometimes referred to as volatility. As [Yousef et al. \(2023\)](#) state, beta may quantify this risk. Beta quantifies the degree of systematic risk associated with an investment in the broader market. Portfolio diversity is ineffective in mitigating market risk; however, an investor may hedge against systematic risk. Market risk encompasses several factors, such as variations in equities or commodity prices, movements in interest rates, and changes in foreign currency rates. Market risk is a fundamental risk that banks are required to disclose and allocate capital for, along with credit risk and operational risk ([Maverick, 2021](#)). [Aruwa and Musa \(2014\)](#), as cited in [Abubakar \(2020\)](#), defined market risk as hazards that are beyond the control of companies and are influenced by events that impact the whole economy. According to [Abubakar \(2020\)](#), market risks refer to external elements that impact the internal operations of organisations. These risks include stock prices, interest rates, and foreign currency risks. Market risk is assessed using the debt-equity ratio, which indicates the proportion of a corporation's debts relative to the equity capital invested by shareholders. A larger ratio suggests the organisation has more outstanding debt than equity, while a smaller ratio indicates the reverse. Creditors might use the ratio to determine their decision to provide credit to the firm. A smaller ratio may appeal more to investors since it suggests that the firm has less debt, but it might also imply a lack of growth potential ([Suttipun, 2023](#)). Market risk includes fluctuations in interest rates, foreign exchange rates, stock values, and commodity prices. Banks that are influenced by market dynamics may encounter variations in the worth of their assets and liabilities, affecting their total profitability. For instance, alterations in interest rates may influence the expenses associated with borrowing, while movements in currency values can affect international commerce and financial standings. Market risk may influence stock prices, which can subsequently impact shareholder value and the financial well-being of organisations ([Jegede et al., 2021](#)). Hence, organisations must possess efficient management and mitigation measures to traverse these risks and maintain consistent financial performance under turbulent market situations.

2.2. Operational Risk

Operational risk encompasses the diverse range of hazards that emerge from a company's routine business operations ([Fadun & Oye, 2020](#)). Operational risk may stem from legal disputes, fraudulent activities, and the possibility that the company's marketing strategies and growth plans may not achieve anticipated goals. Furthermore, money has sufficient equity to cover all corporate obligations ([Abubakar, 2020](#)). A corporation that can fulfil its short-term and long-term debt commitments is seen as financially stable, whereas a company that cannot do so is termed bankrupt. Operational risk exhibits asymmetry by af-

fecting an organisation's financial losses or profits (Abubakar, 2020). In their study, Bui et al. (2023) recommended that banks and other companies effectively control their expenses to mitigate operational risk. This is particularly important when the incremental spending and reduction are equivalent to the expected losses during an operational event. In this research, the cost-to-income ratio is used to assess operational risk. The ratio, referred to as the efficiency or expense-to-income ratio, is closely linked to a corporation's profitability (Abubakar, 2020). Operational risk is the possibility of incurring losses due to failures in internal processes, human mistakes, system malfunctions, or external occurrences (Fadun & Oye, 2020). These problems include many issues organisations encounter in their day-to-day activities, including mistakes, fraudulent activities, system failures, failure to comply with legal and regulatory requirements, and interruptions to corporate operations. It is crucial to differentiate operational risk from credit and market risk since it has gained more importance in the banking industry after severe operational failures and crises. Implementing efficient strategies to control operational risks is crucial for reducing financial losses, enhancing financial performance, and protecting the stability and reputation of banks (Uddin et al., 2020). Financial institutions and other organisations must manage this risk to safeguard their reputation, financial stability, and overall performance (Ebaid, 2023). To successfully handle operational risk, it is crucial to identify and assess risks, establish measures to reduce them, and continuously analyze the efficacy of these measures. It is essential to have a solid organisational risk culture that ensures workers clearly understand their duties and responsibilities. Operational risk management enables organisations to ensure continuous operations, safeguard assets, and cultivate stakeholder confidence. Efficiently managing operational risk allows organisations to decrease the probability and impact of failures, increase decision-making processes, boost happiness among customers and workers, and assure compliance with laws (Ogboghro, 2023).

2.3. Operational Risk Management and Financial Performance

Financial performance metrics may be described as the monetary results of a company's activities (Catherine, 2020). Financial performance metrics are derived from a company's data and may be found in the income statements or balance sheet. Financial metrics are objective indicators since they can be quantified and verified independently (Rudhani & Balaj, 2019). The return on asset ratio quantifies a bank's ability to generate revenue from its fixed assets. This exemplifies the bank's proficiency in earning revenue from its assets (Rudhani & Balaj, 2019). Factors that pose a risk, such as operational risk, substantially influence a bank's financial performance (Fadun & Oye, 2020). Operational risk refers to the inherent uncertainty that develops when internal processes, systems, and policies fail, leading to several instances of bankruptcy throughout history. Operational risks exist due to insufficient systems or principles, such as

worker errors, system breakdowns, fraudulent and corrupt activity, and any event that disrupts company operations (Basel II Committee on Banking Supervision, 2017). Operational risks arise from failures in information management, reporting platforms, and internal governance designed to implement timely remedial actions or compliance with internal risk policy requirements (Rasheed et al., 2018). Based on this statement, it can be inferred that operational risks are mainly influenced by four factors: “people, processes, systems, and external events”. This research uses the tier 1 capital-to-risk-weighted assets ratio to calculate operational risk.

Kamau (2018) examined the impact of operational risk on financial performance. The study examined the financial statements of Kenyan deposit money banks. The study used an ex-post-facto research methodology, analyzing data from 2008 to 2016. The regression analysis findings indicate that operational risk negatively influences financial performance. Furthermore, the investigations uncovered a robust and favourable correlation between the size of a bank and its financial prosperity. This empirical inquiry examined the significance of operational risk and its impact on financial performance (Apata et al., 2022). However, this analysis did not consider the influence of systemic risk on the relationship between these characteristics. Gadzo et al. (2019) conducted a study to examine the impact of loan and operational risks on the profitability of banks in Ghana. The study collected data from 24 banks in Ghana and used Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the data. The results showed that credit risk had a detrimental effect on financial performance. Moreover, it was shown that operational risk had an adverse effect on the financial performance of Ghana’s universal banks. Ko et al. (2019) examined the relationship between operational risk events, credit risk, and company performance. From 2008 to 2010, regression models were used to analyse secondary data obtained from electronic enterprises listed on the Taiwan Stock Exchange. The statistics show a positive correlation between a higher frequency of operational risk incidents and an increased likelihood of loan default and bad performance. From 2009 to 2017, Al-Yatama et al. (2020) conducted a study to examine how risk factors affect the financial performance of insurance companies listed on the Kuwait Stock Exchange (KSE). The research utilises operational, credit, and liquidity risk as distinct components, while return on assets (ROA) and return on equity (ROE) are used as dependent variables. The study’s results indicate that operational and credit risks had the most significant influence on the financial performance of Kuwaiti insurance businesses. In addition, Fadun and Oye (2020) conducted a study on the impact of operational risk management techniques on the financial performance of commercial banks in Nigeria over ten years, from 2008 to 2017. The research used secondary data obtained from the financial records of certain Nigerian deposit money institutions. The results indicated a favourable correlation between operational risk management and bank financial performance.

Oye (2020) examined how operational risk management techniques impact the financial performance of financial institutions in Nigeria. The research used secondary data obtained from audited financial statements of certain commercial banks in Nigeria over 10 years (2008-2017). The data was examined using the Linear Multiple Regression Model. The results indicated a favourable correlation between operational risk management and bank financial performance. In addition, Hakimi (2020) examined the relationship between operational risk, credit risk, liquidity risk, and the financial performance of Tunisian banks from 1990 to 2017. The panel data analysis indicates that enhancing operational risk significantly enhances bank performance. The results indicate that integrating operational risk and loan operations positively and substantially affects banks' profitability. Chioma et al. (2021) investigated the impact of credit and operational risks on the financial performance of public commercial banks in Nigeria. This study used ex-post facto research methodology. The study used secondary data from the Central Bank of Nigeria and annual reports of commercial banks spanning from 2010 to 2019. The theories were examined using the use of SEM. The data indicates that credit risk has a significant and adverse impact on the performance of commercial banks in Nigeria. Operational risk in Nigeria has a significant and advantageous effect on the firm value of deposit money banks.

2.4. Empirical Review of Related Studies

Adeyinka and Henry (2024) examined the relationship between risk management and the financial performance of deposit money banks (DMBs) in Nigeria. The study delineated four distinct aims, research inquiries, and hypotheses to direct its examination. Using a retrospective research methodology, the study analysed existing data for secondary examination since the researcher did not influence the design aspects. The population consisted of twenty-two specifically designated DMBs, with a sample size of United Bank for Africa Plc and Fidelity, chosen via judgmental sampling. The data were collected from the publicly available financial statements of publicly listed DMBs. Descriptive statistics and Ordinary Least Squares (OLS) regression analysis were conducted using E-views-9 software. The analysis found that the loan loss provision had no statistical significance and had no meaningful impact on operational income. Suggested measures include closely monitoring borrowers' financial well-being, forming dedicated teams to manage provisions for potential loan losses, and working with borrowers behind on payments to reduce risks and improve economic outcomes.

Fadun and Oye (2020), investigated how operational risk management methods affect the financial performance of commercial banks in Nigeria. The study demonstrates a strong correlation between operational risk management and financial performance, suggesting that implementing effective risk management strategies might improve the financial performance of banks. The authors propose that banks commit enough resources to comprehend operational

risk to enhance risk management and optimise financial performance. The Linear Multiple Regression Model was used to examine the influence of operational risk management techniques on the financial performance of commercial banks in Nigeria. The researchers gathered a decade's worth of secondary data from audited financial statements of certain commercial banks in Nigeria spanning from 2008 to 2017. The regression model was used to analyze the correlation between operational risk management and financial performance.

Awoniyi et al. (2024), examined how green banking policies affect the financial performance, namely ROA, of publicly traded deposit money banks in Nigeria, considering the issues encountered by the banking sector both globally and locally. Using an ex-post facto research approach, the study examined data from 11 specifically chosen deposit money institutions listed on the Nigeria Exchange Group. The data covered the period from 2012 to 2021. The data were obtained from publicly available annual reports and financial statements, assuring their credibility via independent verification by statutory auditors. Data analysis was conducted using descriptive and inferential statistics, specifically panel regression analysis, with a significance level 0.05. The results showed that the implementation of green banking practices has a notable and beneficial impact on the Return on Assets ($\text{Adj.}R^2 = 0.09$, $W(5, 104) = 10.41$, $p < 0.05$) of deposit money institutions that are publicly traded in Nigeria. Therefore, the research determined that implementing green banking practices leads to enhanced financial performance in the Nigerian banking system. Suggestions include the creation of explicit directives on environmentally friendly banking practices by the Central Bank of Nigeria to encourage banks to adopt them and incorporate them into bank operations to improve sustainable financial performance.

Kamchira (2020), investigated the influence of financial risk management on the financial performance of publicly traded banks in Kenya. The study findings suggest that credit risk, liquidity risk, and interest rate risk have a substantial impact on the financial outcomes of these institutions. The report proposes that regulators implement new rules to enhance bank monitoring methods. Financial institutions should enhance their credit analysis processes and loan administration to manage the difficulties arising from interest rate limitations effectively. The study used a descriptive research strategy in conjunction with quantitative research data. Data from 2009-2018 was gathered via yearly monitoring of bank reports and audited accounts of the listed banks, resulting in panel data.

Eugenia and Ifurueze (2021), examine the influence of financial and operational risk management disclosures on the performance of companies in Nigeria and Ghana. The research assesses the extent of information sharing using an index derived from the Global Reporting Initiative. It also examines companies' financial success by considering their Return on Equity. The study used a panel regression model to examine the findings, using secondary data for the investigation. The research used an Ex Post Facto approach and performed panel regression analysis to examine the influence of financial and operational risk

management disclosures on the performance of firms in Nigeria and Ghana. The study's results suggest that the disclosure of financial and operational risk management has a significant and favourable effect on the performance of companies in Nigeria and Ghana. The research revealed a positive correlation between organisations that have well-implemented financial risk management policies and their profitability. Additionally, the degree of operational risk management was proven to be a determining factor in their earnings. Hence, the research proposes that companies should include more details on their risk mitigation techniques in their yearly reports to augment the comprehension of financial statement readers regarding their vulnerability to risks and their tactics for managing them.

Ejura et al. (2023), investigated the correlation between unsystematic risk and the financial performance of insurance companies in Nigeria. The financial performance of insurance businesses in Nigeria is significantly influenced by capital adequacy risk. Failure to address capital adequacy risk by insurance companies may have a detrimental effect on their financial performance. The presence of liquidity risk has a favourable and statistically significant effect on the financial performance of insurance companies in Nigeria. These findings indicate that insurance companies with more exposure to liquidity risk tend to exhibit more robust financial performance. The reinsurance risk does not significantly influence the financial performance of insurance companies in Nigeria. Nevertheless, when the risk associated with reinsurance is well controlled, it can potentially enhance financial performance. The underwriting risk has a statistically insignificant effect on the financial performance of publicly traded insurance companies in Nigeria. Efficiently managing underwriting risk is crucial for enhancing the financial performance of insurance companies.

Butt et al. (2023), investigated the variables that influence the management of profit distribution in Islamic banks, explicitly emphasising the moderating influence of corporate governance. The research includes a panel dataset of conventional and Islamic banks, covering 2007 to 2017. It utilises a structural equation model. The results suggest that reputational risk plays a role in partly mediating the connection between financial concerns and the performance of traditional banks. However, Islamic banks do not see a substantial moderating impact. The research offers risk managers, regulators, and academics insights into comprehending the significance of reputational risk in improving bank performance.

Ogulu et al. (2020), investigated the influence of financial risk factors on critical performance indicators in the Nigerian petroleum sector. It underscores the need for efficient risk management in an industry at a primary stage. This research addresses a gap in the existing literature by examining the combined influence of financial risks on operational variables. The study design incorporates both qualitative and quantitative methodologies for data collection. The findings demonstrate a significant correlation between financial risk factors and crucial

performance indicators, such as profitability, cash flow, and the cost of doing business. These results contain significant value for financial risk managers and industry stakeholders.

Isamade et al. (2022), examine the impact of financial risk on the operational effectiveness of certain manufacturing companies in Nigeria. Manufacturing enterprises' profitability and financial performance in Nigeria are highly affected by many financial risks, such as operational, credit, and liquidity risks. Manufacturing businesses' earnings for the year are negatively impacted by operational risk, which refers to the risk of financial loss caused by insufficient internal procedures or systems. Credit risk, defined as the possibility of loan default or customer non-payment, substantially impacts the annual profitability of manufacturing companies in Nigeria. Liquidity risk, which refers to the possibility of insufficient cash or readily convertible assets to fulfil financial commitments, also substantially influences manufacturing companies' annual profitability. Manufacturing enterprises in Nigeria must complete a cost-benefit analysis of their daily operations and evaluate the effect on performance before allocating money to objectives. Manufacturing organisations must establish a well-defined and adaptable credit strategy to entice clients and bolster sales income. Achieving financial performance and profitability requires carefully managing current assets and liabilities solutions.

3. Methodology

3.1. Research Design

The chosen research design is ex-post facto based on the positivist perspective, which focuses on gathering and analysing quantitative data, ensuring reliability and control, and making observations measurable for statistical analysis. This design utilises secondary data from the Nigerian Exchange Group (NGX) and annual reports from thirteen banks. Its primary focus is to provide a conceptual foundation for determining the feasibility of different types of information and ensuring their credibility and sufficiency. Due to the reliance on existing events and the need to measure variables using data supplied by the banks being investigated, an ex post facto research technique was used for the study. Ex-post facto is a quasi-experimental design that relies on real-life observations, particularly about group differentiation and data analysis, but it does not qualify as an actual experiment. The ex-post facto design is a direct result of natural history. It emulates actual experiments by contrasting individuals/variables from distinct groups with similar backgrounds and overall settings. The research approach is favoured due to its use of quantitative statistical data to draw conclusions and elucidate the impact of financial risk on the performance of listed deposit money banks in Nigeria. The variables analyzed included EPS and ROA as indicators of the performance of the quoted deposit money bank, which is the variable being measured. The independent variables include operational and liquidity hazards. The focus was on the financial danger that has occurred in Nigerian banks. This

technique enables researchers to analyze the interconnectedness among different factors within a single study.

3.2. Population of the Study

The study population consists of the events, people, or records that contain the data needed for the study. The study's target population comprised all thirteen (13) licensed DMBs quoted on the NGX. All the quoted deposit money banks are up to 10 years on the NGX platform, and the list is shown in **Table 1** below:

Table 1. List of quoted deposit money banks in Nigeria as of 31 December 2023.

S/N	BANK	LICENCE TYPE	YEAR FOUNDED
1	Access Bank Plc	International	1989
2	Ecobank Plc	National	1989
3	FBN Holdings Plc (First Bank)	International	1894
4	FCMB Group Plc	International	1982
5	Fidelity Bank Plc	International	1988
6	Guaranty Trust Bank Plc	International	1990
7	Stanbic IBTC Holdings Plc	National	1989
8	Sterling Bank Plc	National	1960
9	United Bank of Africa Plc	International	1949
10	Union Bank Plc	International	1917
11	Unity Bank Plc	National	2006
12	Wema Bank Plc	National	1945
13	Zenith Bank Plc	International	1990

Source: (Olaiya & Adekunle, 2021).

3.3. Sample Size and Sampling Technique

The population was adopted as the sample size was a census study, i.e., the study was based on the complete data from the individual DMB quoted on the NGX. This is made possible because of the small population. It also bestows on the analysis, reliability, and elimination of sampling errors (Adeghe et al., 2019).

3.4. Sources and Methods of Data Collection

Data collection is the technique used in gathering information from the population under study (Whang et al., 2023). All quoted deposit money banks in Nigeria were considered for this study.

Data for ten years, 2015 to 2023, as they related to the two (2) financial risks (market and operational risks) and performance (EPS and ROA), culminating in a panel data frame (cross-sectional and time series), were used. Each variable

and its proxies were calculated based on the formula adapted from the literature to generate data needed to populate the panel (Kong et al., 2019; Onsongo et al., 2020). The panel data was employed because it helps to study the behaviour of each firm over time and across space (Dabbous et al., 2023). All variables are from secondary data sources and are collected from the published annual reports of the thirteen (13) quoted banks covering the 10 years from 2015 to 2023, the period under consideration. This gives one hundred and thirty (130) data points. The nature of the data collected relates to the subject matter. Akotia et al. (2023), Dabbous et al. (2023), Lim (2023) and Onsongo et al. (2020) also argued that secondary analysis of existing data is efficient and economical because data collection is typically the most time-consuming and expensive part of a research project.

3.5. Method of Data Analysis

3.5.1. Regression Stages of Panel Data

Using OLS or within-group estimations to estimate this panel data model may result in biased results. Blundell and Bond (1998) affirmed that the use of OLS has been vastly criticised due to its ambiguity regarding econometric theories. They further argued that pooled OLS has a shortcoming of truncating zero values of dependent variables, thus sending wrong information. Also, correcting heteroscedasticity and unobserved heterogeneity, the predominant problems in panel data estimation, is one of the reasons some authors have been sceptical of using the OLS in recent years (Dao & Nguyen, 2020). Conventionally, based on econometric principles and the established models in this research, the mean and variances of the error terms would depend on their high moments. The Panel Data Regression Method is considered suitable for solving this problem. Panel data regression analysis is a data structure that is panel data. In most cases, the least squares approach, Ordinary Least Squares, estimates parameters in regression analysis with cross-section data. The Panel Data Regression Method (BLUE) will give the Best Linear Unbiased Estimation result. Cross-section data and time series are used in Data Panel Regression, where the same unit cross-section is recorded at different times. In other words, panel data is information from a group of people observed over time. If we have T periods ($t = 1, 2, \dots, T$) and N people ($I = 1, 2, \dots, N$), we will have a total of $N \times T$ observation units with panel data. The data is balanced if the cumulative unit time is the same for each/cross-section. When the number of time units differs for each person, it is called an unbalanced panel. There are three methods for estimating the regression model using panel data: Pooled Least Square (PLS) or Common Effect Model. The most straightforward technique is to employ a panel data model, which includes time series and cross-section data. Because this model does not consider time and individual dimensions, the assumption is that firms' data behaviour is consistent over periods. The panel data model is estimated using the Ordinary Least Square (OLS) approach or the least square technique.

3.5.2. Pre-Estimation Test

It is expedient to check for the non-existence of unit roots in the variables, as the consistency of the estimates depends on it. This study carried out the panel unit root test at the level and the first difference to determine whether a serial correlation exists. The Levin, Lin, and Chu Test and the Im, Pesaran, and Shin Test were used to test the stationarity of the variables used, based on the view of [Engle and Granger \(1987\)](#), who state that if a model only includes stationary variables, one can assume that estimates are normally distributed, and confidence intervals can be calculated. On the other hand, non-stationarity might lead to erroneous results when tests are used in such situations. This was accomplished by assessing the data in its original form (level) rather than when testing the equation's first differences. According to the usual expectation, the variables should be $I(0)$ in levels and $I(1)$ in the first differences. The variables must, however, be $I(1)$, i.e., stationary in first differences, or the variables must be integrated in the same order.

3.5.3. Test of Multicollinearity using Variance Inflation Factor (VIF)

Collinearity exists when independent variables have a high degree of association, and multi-collinearity exists when independent variables have a high correlation, making it difficult, if not impossible, to separate the effects of each of these variables on the dependent variable, according to [Scott and Wild \(1986\)](#). Simply put, when two or more independent variables move in the same direction and at the same rate, this is known as synchronisation.

Minimum condition (<13) for non-collinear, (>13) for collinear,

However, we relied on Hausman's test model selection criterion in this study.

3.5.4. Model Specification

Using panel data, it is possible to include time effects and control for individual heterogeneity captured by bank-specific fixed or random effects components. This leads to biased results when neglected in cross-section or time series estimations. In financial intermediation, performance proxied by return on assets and earnings per share is a function of how well a bank manages the critical financial risk indicators that moderate the risk appetite and capacity to undertake transactions. As explained earlier in the study, those indicators are market and operational risks. Testing the effect of size on performance is also expedient. The models are:

$$ROA_{it} = X_0 + X_1 MRSK_{it} + X_2 OPSK_{it} + e \quad (1)$$

where:

ROA_{it} = Return on Asset (as a proxy for performance) for bank (i) and at time (t)

X_0 = Constant

X_0, X_1, X_2 = Coefficients

$MRSK$ = Market Risk

OPSK = Operational Risk

e = Error term

it = At time ts

Apriori expectation: $X_1 > 0$ and $X_2 > 0$.

The current research parallels the ongoing investigation since both studies include two independent variables (market and operational risks) and one dependent variable (return on assets) used as a proxy for performance. In the present research, the bank size is considered a control variable, but it is treated as an independent variable in the cited study. In addition, the present research includes an extra dependent variable, EPS. The duration of the current investigation is ten (10) years, while the study by Adeghe et al. (2019) only covered five (5) years. In the present research, thirteen (13) banks were taken into account, while Adeghe et al. (2019) only evaluated twelve (12) banks. Based on this, the previous model was altered and refined by adjusting the variables and creating two separate models instead of only one. The dependent variable (performance) is viewed from the perspectives of EPS and ROA. The adapted model is as shown below:

$$EPS_{it} = \beta_0 + \beta_1 MRSK_{it} + \beta_2 OPSK_{it} + \mu_{it} \quad (2)$$

$$ROA_{it} = \beta_0 + \beta_1 MRSK_{it} + \beta_2 OPSK_{it} + \mu_{it} \quad (3)$$

where:

EPS_{it} = Earnings per Share (as a proxy for performance) for bank (i) and at the time (t)

ROA_{it} = Return on Assets (as a proxy for performance) for the bank (i) and at the time (t) β_0 = Constant

β_1 and β_2 = Coefficients

MRSK = Market Risk

OPSK = Operational Risk

BSZ = Bank Size (Total Assets)

μ = Error term

it = At time ts

The Apriori expectation: $\beta_1 > 0$, $\beta_2 > 0$.

Source: Adapted from Adeghe et al. (2019)

Below is **Table 2** that defines how the independent, dependent and control variables adopted in the models are measured:

Table 2. Measure of variables.

S/N	Code	Variable	Type	Measurement
1	CRSK	Credit Risk	Independent	Total Debt /Operating Income (Ayomide et al., 2022).
2	LIQSK	Liquidity Risk	Independent	Current Assets/Current Liabilities (Wuave et al., 2020).
3	MRSK	Market Risk	Independent	Total Debt/Total Equity (Abubakar, 2020).
4	OPSK	Operational Risk	Independent	Operating Cost/Operating Income (Fadun & Oye, 2020).

Source: Authors Compilation (2024).

4. Analysis and Result

4.1. Descriptive Statistics

The descriptive data in **Table 3** indicate that the mean is 1.404446, with a range of -11.08000 to 7.000000 and a standard deviation of 2.235691. This indicates that some banks included in the sample had losses during specific years, while in other periods, they generated profits from their investments in assets, which aligns with business expectations. The fact that the standard deviation exceeds the mean return on assets (ROA) confirms the fluctuations in ROA across different enterprises and periods. The EPS exhibits a comparable result, with an average EPS of 146.9264, ranging from -1266.000 to 734.000 kobo. The standard deviation of EPS is 223.2264 kobo, significantly higher than the mean EPS. This suggests notable fluctuations in EPS among different banks and periods examined, influenced by each bank's portfolio and its viability in the financial market. The impact of business cycle phenomena, such as inflation and currency rate volatility, significantly influences the fluctuation in returns and profits on banks' investments.

These variables have substantially negatively affected the nation's economy, deterring domestic and international investment. The credit risk had a mean of 9.885385 and ranged from 1.200000 to 98.00000. It had a standard deviation of 17.30591, higher than the mean. They assess differences in credit risk across banks and, over time, based on the creditworthiness of each bank and the prevailing economic conditions in the country's financial industry. The studied banks exhibit moderate variance in liquidity risk, as shown by a mean of 39.73908, standard deviation of 13.45001, and a range of 11.63000 to 878000. However, this variation is less significant than in ROA, EPS, and credit risks. This is because the standard deviation is lower than the mean value. In order to determine the overall standard deviation of a sample from the mean, it is predicted that the standard deviation will be greater than the mean value based on statistical analysis. Therefore, there is heterogeneity across banks throughout different periods, but it is impossible to make conclusions based on a cross-sectional analysis. In addition, the distribution of customers among banks in the Nigerian banking system contributes to this result; certain banks have a more extensive client base than others, affecting their liquidity levels, showing that the liquidity rate is 39.73908% above the CBN target of 30%.

However, in addition to the sampling DMBs examined in this research, as of January, the market liquidity rate was 42.83%, which exceeded the CBN rate by 12.83%. Market risk (MRSK) had a mean of 61.21108 and a standard deviation 17.41582. It varied between 3.550000 and 104.9300, with the standard deviation less than the mean. Similarly, the operational risk (OPRK) averages 10.82700 and varies between -225.0900 and 30.00000, with a standard deviation of 40.33541, which exceeds the mean. Therefore, it may be deduced that there is variability in operational risk across different banks and periods, whereas market risks may

vary within one bank throughout different periods. A significant finding from the descriptive statistics is that there are disparities across banks in terms of risks that are influenced internally but not those that are outside the control of the banks. Operation risk and credit risk exhibit variations among banks due to their ability to influence their credit offerings to customers and operational conditions. Additionally, the Central Bank of Nigeria (CBN) regulates credit facilities by setting credit rates, which banks may or may not comply with. In the past, several banks had a more significant number of branches in various states than what is shown in the sample.

Table 3. Summary of statistics on the effect of financial risks on the financial performance of quoted deposit money banks in Nigeria.

	ROA	EPS	MRSK	OPSK
Mean	1.404446	146.9264	61.21108	10.82700
Median	1.293500	84.00000	61.23000	18.25500
Maximum	7.000000	734.0000	104.9300	30.00000
Minimum	-11.08000	-1266.000	3.550000	-225.0900
Std. Dev.	2.235691	223.2264	17.41582	40.33541
Skewness	-1.985358	-1.032406	-0.374071	-5.115728
Kurtosis	12.70783	14.93455	4.273183	28.21891
Observations	130	130	130	130

Source: Statistical Output (2024).

4.2. Correlation Analysis

Table 4. Correlation analysis.

Probability	Correlation			
	ROA	EPS	MRSK	OK
ROA	1.000000			

EPS	0.744279	1.000000		
	0.0000	-----		
MRSK	0.353216	0.153993	1.000000	
	0.0000	0.0802	-----	
OPSK	0.411959	0.194991	0.308222	1.000000
	0.0000	0.0262	0.0004	-----

Source: Statistical Output (2024).

Table 4 shows the correlation outcome for the current study, where the probability value is presented alongside the correlation coefficient. The purpose is to investigate the strength of the relationship between the response variable and the

regressors and how linear or nonlinear such a relationship appears. Here, the correlation matrix presents the relationship between the interest variables and the effect of financial risk on the financial performance of quoted deposit money banks in Nigeria.

Accordingly, correlation values range between -1 and $+1$, where 75% –99% depicts a robust correlation, 50% –74% signifying a solid correlation existing between the interest variable, 35% –49% indicates a moderate correlation between the interest variable, 25% –34% implies weak correlation and less than 25% indicating a very weak correlation. In line with the outcome of this study, MRSK (0.3532) and OPSK (0.1539) have a positive but weak correlation with ROA. Also, MRSK (0.411959) and OPSK (0.1949) have a positively weak correlation with EPS.

4.3. Test of Multicollinearity Using Variance Inflation Factor (VIF)

Multicollinearity is an econometric problem that arises when there is a high degree of correlation between two or more independent variables, making it difficult to determine the individual impact of each variable on the dependent variable. It accurately records the motion of two or more variables moving concurrently in the same direction and speed. **Table 5** displays the variance inflation factor (VIF) results, which are used to assess the occurrence of multicollinearity among the variables of interest. **Table 5** does not show any evidence of multicollinearity, as shown by the result of the VIF test. This statement is legitimate since all the regressors exhibit a Variance Inflation Factor (VIF) value below 6, which is much lower than the benchmark of less than 10, as [Atiso et al. \(2020\)](#) established. Using panel least square estimators, a robust and reliable conclusion may be anticipated without the need to log the variables.

Table 5. Test of multicollinearity table.

ModelCoefficients ^a	Collinearity Statistics	
	Tolerance (1/VIF)	VIF
MRSK	0.822	1.22
LIQSK	0.932	1.07

a. Dependent Variable: ROA& EPS. **Source:** Statistical Output, (2024).

4.4. Unit Root Test

A unit root test aims to determine whether a series has a unit root. A series suitable for policy prescription or forecasting must exhibit stationarity, meaning its statistical features remain constant over time. This is relevant because a non-stationary series will likely result in a bogus regression estimate, which may lead to incorrect policy recommendations. Based on a priori knowledge, a series should have at least 20 years to be suitable for a unit root test. However, the Hausman test is necessary to determine the most appropriate estimator when

working with panel data and using panel linear estimators such as fixed effect and random effect. In this case, even a series with a shorter duration requires a unit root test as shown in **Table 6**. Hence, the Hadri unit root test is recommended for conducting the unit root test in question (Agubata et al., 2022).

Table 6. Unit-root test results.

Ho: Panels contain unit roots		Number of panels	13.000	
Ha: Panels are stationary.		Number of periods	10.000	
Xtunitroot	Statistic	Statistic	p-value	Decision
ROA	Intercept only*	4.53221	0.000	Stationary
	Intercept and Trend*	13.6063		
EPS	Intercept only*	5.38398	0.000	Stationary
	Intercept and Trend*	6.08588		
MRSK	Intercept only*	1.89833	0.028	Stationary
	Intercept and Trend*	7.21933		
OPSK	Intercept only*	5.63508	0.000	Stationary
	Intercept and Trend*	3.09410		

*Stationary at level, i.e. (p -value < 0.05). Variable Keys: ROA: Return on Assets; EPS: Earnings per share; MRSK: Market Risk; OPSK: Operational Risk. **Source:** Statistical Output, (2024).

The Hadri unit root test estimates are presented in **Table 7**. The tests considered intercept only and, alternatively, intercept and trend both at levels, as the theory demands that the variables of interest must all be stationary at a level to apply the Hausman. Accordingly, the unit root estimates show that all the variables are stationary at the level with intercept only and intercept and trend. This implies that the data is suitable for policy purposes.

Table 7. Hadri panel unit root result.

Variables	Hadri (Intercept only)	Hadri (Intercept and Trend)
ROA	4.53221***	13.6063***
EPS	5.38398***	6.08588***
MRSK	1.89833***	7.21933***
OPSK	5.63508***	3.09410***

***, **, * imply significance at 1%, 5%, 10% level, respectively. **Source:** Statistical Output, (2024).

4.5. Hausman Test

4.5.1. Hausman Test for the ROA Model

The Hausman test using ROA as measure of financial performance has a p -value of 0.7090 which is statistically insignificant at all levels of significance thereby

implying that the random effect estimate is more appropriate for the data in the current compared to the fixed effect and common effect estimators as delineated in **Table 8**. Thus, the study utilizes the random effect estimate in testing the proposed hypothesis.

Table 8. Hausman fixed random.

	Coefficients			
	(<i>b</i>) fixed	(<i>B</i>) random	(<i>b</i> – <i>B</i>) Difference	sqrt(diag(<i>V_b</i> – <i>V_B</i>)) S.E.
MRSK	0.0243831	0.0265807	–0.0021976	0.0020987
OPSK	–0.000015	–0.0005378	0.0005228	0.0014244

b = consistent under *H*₀ and *H*_a; obtained from xtreg; *B* = inconsistent under *H*_a, efficient under *H*₀; obtained from xtreg; Test: *H*₀: difference in coefficients not systematic, $\chi^2(5) = (b - B)'[(V_b - V_B)^{-1}](b - B) = 2.94$, Prob > $\chi^2 = 0.7090$. **Source:** Statistical Output, (2024).

4.5.2. Hausman Test for the EPS Model

Similarly, the Hausman test using EPS as measure of financial performance shows that *p*-value of 0.215 which is statistically insignificant, implying that random effect is more appropriate than the fixed and the common effect on the overall according to **Table 9**. As such, the random effect estimates is employed in the testing of the proposed hypothesis for the current study.

Table 9. Hausman fixed random.

	Coefficients			
	(<i>b</i>) fixed	(<i>B</i>) random	(<i>b</i> – <i>B</i>) Difference	sqrt(diag(<i>V_b</i> – <i>V_B</i>)) S.E.
MRSK	0.9886222	1.378193	–0.3895704	.
OPSK	–0.649431	–0.816758	0.167327	.

b = consistent under *H*₀ and *H*_a; obtained from xtreg; *B* = inconsistent under *H*_a, efficient under *H*₀; obtained from xtreg; Test: *H*₀: difference in coefficients not systematic, $\chi^2(5) = (b - B)'[(V_b - V_B)^{-1}](b - B) = 7.08$, Prob > $\chi^2 = 0.215$. **Source:** Statistical Output, (2024).

4.6. Panel Regression Model - ROA and EPS as Measures of Financial Performance

The panel regression model in **Table 10** reveals that the variables MRSK and OPSK impact ROA 0.6642, 0.6133 and 0.6509 which approximate to 66%, 61%, and 65% for the pooled, fixed, and random effect models, respectively while ROE is impacted by 0.7003, 0.7441 and 0.7279 representing about 70%, 74% and 73% consistently. The remaining impact is accounted for by the error terms, which represent other factors not considered in this study. The regression line for the model for PEM is indicated as $ROA = -1.250042 + 0.0385795 (MRSK) -$

0.0027686 (OPSK). However, with a significance level entailing p -Values (<0.05), it indicates the rejection of the null hypotheses that suggest no significant impact of the variables on ROA. Therefore, the model for the PEM includes $PEM = -0.000015 + 0.0243831 (MRSK) - 0.000015 (OPSK)$ while REM entails $REM = 0.0265807 + 0.0265807 (MRSK) - 0.0857249 (OPSK)$. This study's conclusion corroborates the study of Wakarindi (2018), Oduro et al. (2019), and Ndubuisi and Amedu (2018), which demonstrate that OPSK is a negative predictor of ROA while MRSK is its negative predictor in all scenarios. These findings were reaffirmed by the R-squared values obtained from the research.

Table 10. Estimated results: panel regression model—ROA and EPS as measures of financial performance.

ROA	PEM			FEM			REM		
	Coef.	<i>T</i>	$P > t $	Coef.	<i>T</i>	$P > t $	Coef.	<i>Z</i>	$P > z $
MRSK	0.0385795	3.54	0.001	0.0243831	2.46	0.015	<i>0.0265807</i>	<i>2.75</i>	<i>0.006</i>
OPSK	-0.0027686	-0.27	0.787	-0.000015	-0.00	0.999	<i>-0.0005378</i>	<i>-0.06</i>	<i>0.950</i>
_cons	-1.250042	-1.21	0.227	-0.0873467	-0.06	0.950	<i>-0.0857249</i>	<i>-0.07</i>	<i>0.941</i>
Number of groups		NA			13.0000			<i>13.0000</i>	
Number of obs		130.0000			130.0000			<i>130.0000</i>	
F(5, 124)		8.90			4.00			<i>6.24</i>	
Prob > F		0.0000			0.0022			<i>0.0000</i>	
R-squared		0.6642			0.6133			<i>0.6509</i>	
Adj R-squared		0.6345			0.6245			<i>0.6145</i>	
EPS	PEM			FEM			REM		
	Coef.	<i>T</i>	$P > t $	Coef.	<i>T</i>	$P > t $	Coef.	<i>Z</i>	$P > z $
MRSK	2.959228	2.61	0.010	0.9886222	0.99	0.323	<i>1.378193</i>	<i>1.38</i>	<i>0.167</i>
OPSK	-1.339167	-1.26	0.210	-0.649431	-0.74	0.462	<i>-0.816758</i>	<i>-0.92</i>	<i>0.360</i>
_cons	-263.1657	-2.46	0.015	-184.1418	-1.33	0.187	<i>-102.6459</i>	<i>-0.87</i>	<i>0.383</i>
Number of groups		0.0000			13.0000			<i>13.0000</i>	
Number of obs		130.0000			130.0000			<i>130.0000</i>	
F(5, 124)		6.21			7.33			<i>NA</i>	
Prob > F		0.0000			0.0000			<i>0.0000</i>	
R-squared		0.7003			0.7441			<i>0.7279</i>	
Adj R-squared		0.6810			0.6910			<i>0.7110</i>	

Note: selected model in italics. **Source:** Author's analysis 2024.

Essentially, MRSK and OPSK have significantly impacted the DMBs performance in Nigeria throughout the investigated time frame. The effect of market and operational risk on the performance of the DMBs in Nigeria can be attributed to two main factors. Firstly, our currency's high exchange rate and depreciation compared to the dollar have had a negative impact. Secondly, the varia-

tions in interest rates have been unfavourable for banks' lending to foreign trade, leading to a significant reduction in loan extension to the real sector of the economy, which aligns with the findings of [Isedu and Erhabor \(2021\)](#). The CBN has classified Nigeria's DMBs into local, regional, national, and international service providers, effectively minimising this danger ([Ayman et al., 2020](#); [Karugu et al., 2020](#)) triggered by the market risks. Under these arrangements, microfinance banks are intended to operate at the local level. At the same time, the DMBs with a capitalisation value of at least ₦25 Billion but not excessively strong are designated to operate at the regional level, such as WEMA Bank, which has a limited number of branch networks. Other banks with over ₦30 billion capitalisation and extensive branch networks operate nationally. Examples include Unity Bank and Fidelity Bank. However, banks with a capitalisation value beyond ₦150 billion can operate worldwide. Not all of Nigeria's DMBs operate worldwide, which allows them to avoid the significant negative impact of market risk on their performance ([Odubuasi et al., 2020](#); [Isedu & Erhabor, 2021](#)).

5. Conclusion and Recommendation

This study that assessed the impact of market and operational risk impact on DMBs performances in Nigeria using the panel regression approach concludes that there is a presence of weak impact of market and operational risks on the DMBs as indicated by an R Square value of 0.6642, 0.6133 and 0.6509, which represents about 66%, 61%, and 65% impact of the variables MRSK and OPSK on EPS while ROE is impacted by 0.7003, 0.7441 and 0.7279 representing about 70%, 74% and 73% consistently, for pooled effect model, fixed effect model and random effect model respectively. At the same time, the rest are covered by the error terms, as the other factors have not been considered in this study. This study, thus, recommended that:

- 1) Management should prioritise implementing cost management measures to reduce the ratio of operating expenditure, ultimately resulting in improved profit margins. Suppose the bank does not aggressively address recurrent modest losses in its daily operations, often caused by its inability to use its fixed costs effectively. In that case, the bank's demise is inevitable.

- 2) Consistent with the suggestions of [Chukwunulu et al. \(2019\)](#) and [Isedu and Erhabor \(2021\)](#), this study proposes that both bank management and the CBN should not only develop risk management policies but also take proactive measures to implement risk identification, assessment, measurement, and control mechanisms by international standards. This will help prevent financial crises and ensure the overall performance of deposit money banks.

- 3) The research suggests that maintaining liquidity levels above the ideal threshold is recommended for DMBs in Nigeria. This is because higher liquidity levels have been shown to impact performance positively and are identified as the most significant risk factor influencing DMBs' performance. Additionally, the report advises DMB regulators to exercise caution when considering raising the

minimum liquidity ratio since doing so may negatively impact the functioning of the DMBs.

4) The CBN must maintain the minimum liquidity requirement for DMBs at 30%. This measure has a negligible adverse impact on DMBs' profitability, so ensuring the system's overall stability in the long and short term is of the utmost importance. DMBs' sustainability relies on effectively managing liquidity and achieving profitability. Therefore, it is crucial to prioritise implementing measures that ensure successful liquidity management. These procedures will mitigate or eradicate the adverse effects of excessive or inadequate cash.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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