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# Operating Efficiency and Financial Performance of Deposit Money Banks in Nigeria

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**ABSTRACT:** *This study has examined the influence of operating efficiency on the financial performance of Deposit Money Banks (DMBs) in Nigeria. Data used were extracted from the Annual Reports and Accounts of selected twelve (12) listed banks as on May 13, 2021 from 2011 to 2020. The Pearson Product Moment Correlation analysis was employed to determine the relationship between operating efficiency and financial performance of sampled banks. Panel Least Square regression was deployed to analyse the effect of operating efficiency on financial performance of the DMBs while the one-way ANOVA test was engaged in ascertaining significant differences in financial performances of the Systemically Important (D-SIBs) and the Non-Systemically Important (D-NSIBs) Banks. Findings revealed positive significant effect of operating efficiency on financial performance of all DMBs while there was no significant difference in the mean financial performances of the D-SIBs and D-NSIBs in Nigeria over the study period. It is therefore recommended that bank managements exercise due diligence in controlling operating costs of banks and Regulators should pay equal supervisory and regulatory attention to all banks without discrimination as all DMBs have the potential to exhibit systemic importance in the long run.*

**KEYWORDS:** operating efficiency, financial performance, domestic systemically important banks

## INTRODUCTION

Banks constitute a very important most regulated sector of the Nigerian financial services industry and indeed of any nation. This is because of the financial intermediation role they play as mobilisers and allocators of funds from the surplus economic unit of the country to the deficit unit

for economic growth and development. The Nigerian financial system is still developing and so activities of banks have tended to overshadow those of other non-bank financial institutions who are co-players in the financial services industry. Banks have, therefore, attracted special regulatory and supervisory attention in the country. Nwude and Okeke (2018) also declared that the importance of banks in any economy cannot be overemphasized in the development of any nation, as they are an important component of the financial system because they channel scarce resources from surplus economic units to productive sectors. However, in spite of the several reforms, stringent legal and supervisory frameworks put in place to streamline banking operations in the country and put the sector on the path of stability and growth, bank failure has been a regular phenomenon in the country. This has constituted a great source of concern to the regulators in the country.

Factors that lead banks to fail are many and varied. Many scholars attributed the phenomenon to bank-specific causes and in some cases, industry-specific characteristics. Onyenwe (2019) and Ebiringa (2011) opined that bank distress is not an accident and does not occur in a day as it is rather organic as well as systemic. Among the many factors claimed to be responsible for distress of banks in Nigeria is operating inefficiency. Operating efficiency of commercial banks has been cited as one of the key factors contributing to banks' success or failure (Lotto, 2019) and it is one of the bank-specific factors that determine their financial performance (Nyakieni, 2022). Lotto (2019) further posited that operating efficiency in the main refers to the ability of the bank to reduce operating costs in attaining its goals through the right combination of people and technology. This is why several studies such as Nyakieni (2022), Msomi and Olarewaju (2022) and Eferakeya and Erhijakpor (2020) among others, explored the factors affecting banks' efficiency either by focusing on cost functions or profit functions, implying that efficiency can be measured in three ways; maximization of output, minimisation of cost and maximisation of profits.

Traditionally, however, return on assets (ROA) and return on capital employed (ROCE) are the most popular standard metrics of bank performance. These are considered no longer adequate for the assessment of bank performance since they do not satisfactorily meet the needs of all interest groups other than shareholders and prospective investors. Osuma, Ikpefan, and Omankhanlen (2021), Muazu, and Nashehu (2021), opined that profitability and asset base are the two traditional metrics of bank performance; while the profitability pleases shareholders, asset base will please only the board of directors. In recent times, net interest margin (NIM) measurements has become very important performance metrics of banks (CBN, 2013), as it is considered the most appropriate criterion for evaluating the effectiveness and stability of banks' operations that is superior to the return on assets (ROA) (Saksonova, 2014).

One of the latest strategies aimed at strengthening the financial system and preventing a possible industry-wide crisis following the global meltdown of 2007-2009, is the systemic importance

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categorisation of banks. Under this model, some mega banks whose distress or disorderly failure could cause significant disruptions to the extended financial system because of their size, complexity, interconnectedness and substitutability were identified by the regulators and subjected to enhanced regulation and supervision. These "too-big-to-fail" banks as they are otherwise called, have been tagged Domestic Systemically Important Banks (D-SIBs).This is because the larger a financial institution is the more likely its failure will damage the economy and the financial markets where they operate, leading to loss of depositors' confidence in the entire financial system. Several studies have been conducted on the nexus between operating efficiency and bank performance but findings have always been mixed with some inconclusive, thus creating a research gap.Though the literature is replete with studies on financial performance of deposit money banks (DMBs) generally, studies on the financial performance of the D-SIBs which is also a new classification approach to banks, is yet scanty especially in Nigeria. Another research gap is thus created. Based on these studies and varying gaps in the determinants of DMBs' financial performance, there is the need to conduct further studies on DMBs in Nigeria with special focus on their systemic importance. This present study therefore seeks to bridge the gaps in financial performance studies of Nigeria Systemically Important Banks (D-SIBs). The main focus of the study is to investigate the effect of operating efficiency on performance of deposit money banks (DMBs) in Nigeria. Specifically, the study is to ascertain the effect of operating efficiency on net interest margin (NIM) of D-SIBs and D-NSIBs in Nigeria during the period 2011 to 2020, and to determine significant differences in their operating efficiency during the period. Thus, the following hypotheses have been generated to drive the study:

**$H0_1$**: Operating efficiency has no significant effect on net interest margin (NIM) of D-SIBs and D-NSIBs in Nigeria during the study period.

**$H0_2$**: There is no significant difference between the financial health and performance of D-SIBs and D-NSIBs in Nigeria during the study period.

Results of this study will indicate to the regulators those banks previously not classified as systemically important that needed to be upgraded to D-SIB status for enhanced supervision. The study will further assist the regulators to maintain stability in the banking sector which will translate into a sustained public confidence in the nation's banking system generally Furthermore, the concerned banks themselves could use the result of the study to mirror their performance and be aware of early warning signals of defects in their financial health for prompt remedial action.. The outcome of the study will also be useful to other researchers who might want to examine areas of further studies to discover models that could be deployed to sustain the systemic importance of the banks that are the subject of the study. This introductory section will be followed by review of relevant literature in section 2 while section 3 provides the methodology adopted. Section 4 presents the results and discussions and section 5 concludes the study.

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## LITERATURE REVIEW

*Conceptual Review*

### Bank Performance Measures

Performance has been defined as the record of outcomes achieved and efforts expended to achieve set targets. In other words, performance is regarded as accomplishments in the process of performing a task (Jesuwunmi, Nzewi, Adewoyin&Agbadua, 2019). Jesuwunmi *et al* (2019) also considered that organizational performance could be two-dimensional, either financial or non-financial. Financial performance is an assessment of the financial conditions or profitability of a bank in order to gain insight into the health of the bank using an index that relates two pieces of financial data, called financial ratios (Torbira and Zaagha, 2016). Non-Financial performance on the other hand, refers to the perception of various stakeholders on performance of the bank based on important criteria. This study is, however, concerned about the financial performance of banking organizations and so has been restricted to accounting ratio analysis of the financial results of sample banks during the study period .In addition to commonly used measures of financial performance net interest margin (NIM) has been used successfully, Following Adam (2014), this study has used net interest margin (NIM).) to proxy bank performance.

### Theoretical Framework

There are several theories that have been used to describe the inter-link between operating efficiency and financial performance; however, this study is predicated on the economies of scale theory.The *theory of economies of scale* was proposed by Adam Smith (1723-1790). Economies of scale are when a company enjoys a reduction in its average cost of production because of an increase in production output. Economies of scale theory in its application to the banking sector is that a bank that is large in size would enjoy economies of scale and produce its services at a lower cost per naira of total deposits.. As a result, large banks are deemed to earn higher profits than smaller banks. This is why it is very often expected that bank size should be positively related to bank profitability. Studies such as Hughes and Mester (2013) and Wibowo (2016) have shown that bank efficiency has a lot to do with bank asset size. European and American mega banks that operate as large conglomerates offering extended financial services have also been observed to be more efficient than their smaller competitors because they enjoy greater economies of scale (Feng and Serlitis, 2010, Dijkstra, 2013).

### Empirical Review

### Operating efficiency and performance of banks

Nwosu, Okedigba, and Anih (2020) investigated the extent to which non-performing loans affect Nigerian commercial banks' profitability was the subject of this study. Results showed a negative and statistically significant impact of non-performing loans on banks' profitability. The study

further showed that lower bank profitability could be explained by higher volume of non-performing loans, increased liquidity ratio and inflation, while higher profitability could be as a result of increase in bank size and capital adequacy ratio.

Bhattarai (2018) examined the determinants of loan loss provisions of ten sample commercial banks in Nepal for the period spanning 2012/ 2013 – 2016/ 2017 ( a total of 50 observations). The study used loan loss provision to total assets as dependent variable and natural log of total assets, total loans to total assets ratio, non-performing loans to total assets ratio, earnings before taxes and provisions to total assets, capital adequacy ratio, and loan to deposit ratio were taken as independent variables. Findings from the estimated regression models reveal that non-performing loans ratio and loan to deposit ratio have significant positive impact on loan loss provisions. The study therefore concluded that non-performing loan ratio and loan loss to deposit ratio are the main determinants of loan loss provisions of sample commercial banks in Nepal.

.Osuma, Ikpefan and Omankhanlen (2021). This study examined the efficiency of the systemically important banks (D-SIBs) listed in Nigeria using total deposits, total assets, and operating expenses for its inputs and net interest income, loans and advances, and gross earnings for its output sourced from the summed data from the annual published financial statements of the sample listed D-SIBs for years 2009-2019. The study concluded that big or large financial disclosures accruing to financial institutions does not secure its improved efficiency level which could metamorphose into financial stability and that huge total asset is also not always directly proportional to an efficient financial institution. It therefore recommended that bank managements should introduce cost-effective and/or efficient strategies as part of their long term decisions. The study further recommended that regulatory assessments should not solely be carried out by inferring from the banks' financial figures alone, other key categorical examples should also be used in evaluating DMBs' performance. Examples include inputs such as numbers of employees and number of hours worked as outputs.

Vulley (2022) investigated the input of internal control systems on the operational efficiency in the banking sector of Ghana. Primary data were obtained from the field with the instrument of structured questionnaire. Both descriptive and inferential techniques of simple regression analysis (OLS) were deployed to analyze the data.The study concluded that efficient internal control systems impact positively on the operational efficiency in the banking sector, thus reducing malfeasance and misuse of stockholders' funds. The study then recommended that bank managers should take adequate steps to ensure regular and timely review of internal control architecture, re-strategize and adopt mechanism that will ensure proper communication of the control framework to employees.

Muazu and Nashehu (2021). This study adopted a case study approach to discover some of the opportunities and benefits derivable from operational excellence to the commercial banking

operations in developing countries as experienced by banks in some developed nations. The paper concluded that operational excellence improves banks' service delivery, customer satisfaction, cost effectiveness and efficiency, substantial increase in revenue and profit. Hence, Nigerian banks must leverage their workforce, processes, innovation, and governance to attain excellence in their operations for them to remain competitive in both regional and international markets.

Khan (2022) examined those factors that can affect the operational efficiency of Saudi commercial banks. The study used data from listed banks in Saudi from 2010 to 2017. Panel data estimation technique of pooled ordinary least squares (OLS) was used with random and fixed effects estimations to find the significant factors. Based on the Hausman test results, the fixed effects estimation results were used for discussions. The study discovered that operational efficiency of Saudi banks was adversely influenced by capital adequacy, profitability and bank size but positively related to liquidity and asset quality.

Nyakieni (2022) investigated the effect of management efficiency on financial performance of commercial banks in Kenya. The study adopted the explanatory research design and used secondary consolidated panel data of 40 commercial banks from the Central Bank of Kenya and the International Monetary Fund (IMF).Findings revealed that there is significant co-integration relation between management efficiency and financial performance of commercial banks in Kenya. Management policies and strategies that are cost effective and productive efficient could raise the managerial efficiency and financial performance of Kenyan banks. Thus, based on these findings, the study recommended that banks in Kenya should put a lot of focus on their internal processes since management efficiency had positive influence on the profitability policies.

Msomi and Olarewaju (2022). This study looked at the operational efficiency determinants of four (4) large South African banks. A quantitative, descriptive, correlational design was employed and the System-Generalized Method of Moments (STS-GMM) techniques were used for the analysis. Findings revealed that operational efficiency was positively correlated with capital adequacy ratio, credit risk, inflation, and exchange rate, and negatively correlated with profitability, money supply and GDP.Thus, the study recommended that bank management should decrease administrative costs, evaluate customers' credit worthiness before loans are issued, and raise bank size as operational conditions require, boost intermediation and anticipate inflation so as to operate more efficiently.

Lotto (2019) examined factors affecting operating efficiency of 36 commercial banks in Tanzania for the period 2000 and 2017. Results show that bank liquidity and capital adequacy have a positive relationship with operating efficiency while bank profitability and operating efficiency are also directly related, pointing to the need for banks to emphasize the improvement of their earning generating power to increase operational efficiency.

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Eferakeya and Erhijakpor (2020) in their study examined the determinants of operating efficiency of Nigeria's banking sector during the period 2002 and 2019. The study result showed that the Nigerian banking sector was both efficient and inefficient during the period by using the Data Envelopment Analysis (DEA) model and Tobit Regression model. Furthermore, the estimation results showed that bank size and intermediation ratio were positive and significant in determining banking sector operating efficiency while overhead costs ratio, credit risk and inflation rate were negatively significant in determining operating efficiency. Bank managements should therefore deploy creative strategies in cutting down overhead costs, engage in proper credit evaluation, and ascertain customer credit-worthiness before extending credits.

Innocent, Ademola&Teryima (2019). This study examined the effect of capital adequacy, credit risk, and operating efficiency on the performance of commercial banks in Nigeria. The study used panel data sourced from the Central Bank of Nigeria (CBN) Annual Bank Reports and employed the random effects regression method of analysis. Findings showed that capital adequacy variables have significant positive effect on the banks' financial performance. However, credit risk and operating efficiency have negative and statistically significant effect on the financial performance of banks in Nigeria. The study concludes that capital adequacy strongly and actively stimulates, improves and grows the financial performance of commercial banks and that sufficiency of capital, combined with adequate management, translate to improved performance. The study therefore recommended improvement in management of banks' assets and liabilities, especially on the quality of assets portfolio and deposit liabilities in order to improve on the achievement of corporate objectives. Enhanced regulatory framework should be put in place that will be dynamic and effective.

**Bank size and performance of banks**

Zedam and Daas (2017) attempted to evaluate the financial performance and soundness (health) of five (5) Palestinian commercial banks for year 2015 using the CAMEL rating technique. The researcher opined that the CAMEL model provides a means to categorize banks based on their overall health, financial status and managerial operation. Five main performance assessment areas were considered: capital adequacy, asset quality, management efficiency, earnings quality and liquidity. Appropriate financial ratios covering the interplay of the capital adequacy ratio, non-performing loans to total loans, and total loans to total deposits were applied and banks were ranked on the component and composite ratings as per the Uniform Financial Institutions Rating System (UFIRS) scale. The study revealed that Bank of Palestine, which is generally considered the largest local bank, came top in performance rating when the UFIRS was applied to the sampled banks. A particular discovery was that the banks' sizes (largest to smallest) also coincide with their financial health ratings in that descending order.

Ramadan, Kilani and Kaddumi (2011) investigated the nature of the relationship between profitability of banks and the characteristics of internal and external factors. A panel set of 10

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Jordanian banks over a period of ten years (2001-2010) was used. Their results show that Jordanian banks' characteristics explain a significant part of variation in bank profitability, using return on assets (ROA) and return on equity (ROE) as measures of profitability. Contrary to ordinary expectations, the result also showed that the estimated effect size did not support the significant scale economies. Ramadan, *et al,* (2011) claimed that their empirical results revealed that the relationship between size and profitability are mixed as the risk approach to size suggests that large banks would require lower profits because of the lower interest rates charged to borrowers. They concluded that if larger banks control big share of the market in a non-competitive environment, they would require higher profit through higher lending rate, and low deposit rate.

Okoye, Adetiloye, Erin and Evbuomwan (2017) examined the performance of the Nigerian banking sector in the pre and post- consolidation period to provide empirical evidence on the impact of banking consolidation reform on the performance of the sector. Two independent samples representing the 9-year period preceding 2005 banking consolidation exercise and 9 years post consolidation period were analyzed using non-performing loans ratio, return on assets and capital adequacy ratio and bank assets ratio (bank size) as variables. Findings revealed that the mean of banking asset ratio shows an increase post consolidation, though corresponding associated risks also increased. The huge increase in bank assets were shown to be invested in high risk ventures and this situation compromised the quality of the assets.

Babanskiy (2012) investigated factors and parameters that are important and significant in the forecast of bank failures in a sample of Russian banks. The study used the natural logarithm of total assets to proxy asset size and came to the conclusion that strong and solvent banks have the larger asset size based on the premise that large banks hold more assets and are better able to diversify and consequently reduce their risks. Unexpected outcome of the study is that the size of the banks' assets and cash to assets ratio are significant for probability of default.

Adam (2014) investigated the financial performance of Erbil Bank for Investment Finance, Kurdistan Region of Iraq during the period 2009-2013. Return on assets (ROA), return on equity (ROE) and return on deposit were taken as dependent variables while bank size, asset management and operational efficiency were taken as independent variables. Regression analysis was used in testing the relationship between profitability variables and bank size. Results showed that the ROA of the banks were strongly and negatively influenced by the bank size.

Yusuf and Tijani (2019) evaluate the financial health of Deposit Money Banks (DMBs) in Nigeria using CAMELS rating model based on three characteristics-operating license, operating structure, and systemic importance. The ex-post facto research design was deployed to analyze secondary data from annual reports of 12 selected listed banks, covering the period 2010 to 2017. Three research hypotheses were tested using the *Mean and Independent sample t-test* to present and analyse the data.The paper provides evidence of a statistically significant difference between the

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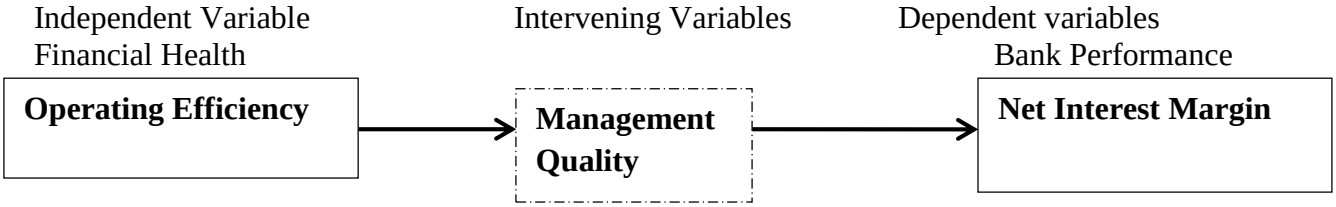
financial health of D-SIBs and non-D-SIBs in Nigeria ($t_{cal}(10) = 2.832 > t_{tab} = 2.228$; p-value = 0.018). Based on their findings, the paper concluded that the financial health of DMBs does not differ based on the type of operating licence they hold and the structure they operate. Following their conclusion, they recommended that the CBN should tighten its existing prudential guidelines on Deposit Money Banks in Nigeria.

**Conceptual Framework**

Figure 1 shows the linkages between the dependent and independent variables as conceptualized by the researcher following a thorough search of relevant literature and established theories.




Sources: Adapted from Wuave, Yua and Yua (2020), Jesuwunmi, Nzewi, Adewoyin&Agbadua (2019) and Babar and Zeb (2011)

## METHODOLOGY

This study adopted the *ex-post facto* research design using a set of panel data obtained from the respective websites of the sampled banks for years 2011-2020. The study population is the entire twenty-one (23) deposit money banks operating in the Nigerian banking sector as at May 13, 2023. Using a multi-stage, non-random sampling method approach, twelve (12) banks, divided in equal number of six (6) for the D-SIBs and six (6) for the D-NSIBs for equal representation were purposively selected for the study. The first step was to filter the 21 DMBs based on their listing status on the Nigerian Exchange Group (NGX), and the final selection was made on basis of their asset size. The study variables were measured by financial ratios selected from popular and widely applied CAMELS rating system in prior empirical studies to capture the most salient financial health and performance indicators of banks.

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**TABLE 1: Variables Operationalization Summary**

| Variables | Operationalisation | Source |
|---|---|---|
| **Dependent Variable**<br>Net Interest Margin (NIM) | Ratio of net interest income to gross interest income | Lotto (2019) |
| **IndependentVariables**<br>NIITA | Ratio of net interest income to total assets | Gautam(2020) |
| NICTA | Ratio of non-interest income to total assets | Gautam(2020) |
| OEOI | Ratio of operating expenses to operating income | Eferakeya and Erhijkpor (2020) |
| BSZE | Bank size measured as natural log of total assets | Eferakeya and Erhijkpor (2020) |

Source: Sundry Previous Authors

## METHODS OF DATA ANALYSIS AND MODELS SPECIFICATION

### *Methods of Data Analysis*

To analyse the effect of risk assets management and operating efficiency on financial performance of the DMBs, panel data regression analysis was used while the One-way ANOVA was deployed in establishing significant difference between the performance of the D-SIBs and D-NSIBs in Nigeria. The panel data methodology is acclaimed to effectively capture both the time series and cross-sectional data. Furthermore, to determine the most appropriate model to apply for the regression analysis, the Hausman test was carried out.

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**Models Specifications**

The analytical models for this study follow after Lotto (2019 ) that linked bank financial health or soundness to performance using net interest margin (NIM) to proxy performance. Slight modifications were however made to their surrogates for the independent variables in line with current literature.

**Operating Efficiency and Net Interest Margin (NIM)**

This model's response variable (NIM) is the same as used in Lotto (2019) except that it was used as explanatory variable in that study. This researcher considers the net interest margin (NIM) which is the difference between bank's interest earned and that paid by the bank on its own portfolio as appropriate measure of a bank's operating efficiency. The explanatory sub-metrics are also adopted from Lotto (2019). The effect of operating efficiency on net interest margin (NIM) realized by banks is given by the following regression models

NIM = f (NIITA, NICTA, OEOI, BSZE) ……... 1

Expressed in econometric model:

NIMit = $\eta_0 + \varphi_1 NIITA_{it} + \varphi 2\, NICTA_{it} + \varphi_3 OEO1_{it} +$
$\varphi 4 BSZE_{it} + \varepsilon it$……2

Where

NIMit = Net Interest Margin (Banks Performance)

$\eta_0$= Intercept (a constant)

$\varphi 1 - \varphi 4$= the slope/gradient of the regression line

$NIITA_{it}$ = the ratio of net interest income to total assets

$NICTA_{it}$= the ratio of non-interest cost to total assets

$OEOI_{it}$ = the ratio of operating expenses to operating income

$BSZE_{it}$ = Bank size as natural logarithm of total asset

$\varepsilon_{it}$ = Stochastic error term

***A Priori* Expectation**

The *a priori* expectations in this model are that NIITA and BSZE have positive relationships with performance of banks ($\varphi 1 > 0,\ and\ \varphi 4 > 0$) measured as net interest margin (NIM), while NICTA and OEOI have negative relationships with performance ($\varphi 2 < 0,\ \varphi 3 < 0$). This implies that a unit increase in NIITA and BSZE will lead to increases in performance while increases in NICTA and OEOI is expected to result in a decrease of respective estimated amounts in performance.

**RESULTS AND DISCUSSIONS**

**Descriptive Statistics**

Table 1 showed the descriptive statistics of the dependent and explanatory variables used in the study. Operating efficiency was captured by ratio of non-interest cost to total assets (NICTA), ratio

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of net interest income to total assets (NIITA), bank size (BSZE) and ratio of operating expenses to operating income (OEOI), while financial performance of D-SIBs and D-NSIBs was represented by the net interest margin (NIM). The results revealed that on average the net interest margin (NIM) of deposit money banks (DMBs) was 4.07 per cent while the highest and lowest values stood at 4.44 per cent and 3.58 per cent respectively during the period of study. The recorded standard deviation of 0.179 which is lower than the minimum value indicates that the distribution is considerably homogenous and its curve symmetrical as the data points are close to the mean value. The average NIM of 4.07 per cent can therefore be considered a good representation of the financial performance of the sample banks during the period under examination

**TABLE 2: Descriptive Statistics Showing the Relationship between Operating Efficiency and Financial Performance (NIM)**

| Variables | obs | Mean | Std Dev. | Min | Max |
|---|---|---|---|---|---|
| NIM | 120 | 4.0708 | 0.1787 | 3.5849 | 4.4354 |
| NICTA | 120 | 1.6494 | 0.2559 | 1.0953 | 2.3795 |
| NIITA | 120 | 1.5502 | 0.2277 | 0.9555 | 2.0136 |
| BSZE | 120 | 2.0288 | 0.1376 | 1.6864 | 2.3185 |
| OEOI | 120 | 4.1912 | 0.2637 | 3.4803 | 5.1732 |

. Source: Researcher's Computations

Table.1 further showed that the average values of operating efficiency parameters, determined by ratio of non-interest cost to total assets (NICTA), ratio of net interest income to total assets (NIITA) bank size (BSZE) and ratio of operating expenses to operating income (OEOI) to be 1.65, 1.55, 2.03 and 4.19 per cent respectively and their corresponding standard deviations about their mean values to be 0.26, 0.23, 0.14 and 0.26. The standard deviation values are lower than the mean values signifying a symmetric distribution with the majority values clustering around the mean values. The average values can therefore be relied upon as being representative of the average operating efficiency of sample DMBs during the period covered by the study. The maximum and minimum values for the ratio of non-interest cost to total assets (NICTA), ratio of net interest income to total assets (NIITA), bank size (BSZE) and ratio of operating expenses to operating income (OEOI) were 2.38 & 1.10, 2.01 & 0.96, 2.32 & 1.69 and 5.17 & 3.48 per cent respectively.

**Correlation Analysis**

The pairwise correlation matrix in Table 2 was constructed to test for multicollinearity among variables. Multicollinearity is a condition where the explanatory variables are practically linear dependent. The weak and very weak associations (.104- .707) between the response variables (NIM) and the explanatory variables (NICTA, NIITA, BSZE and OEOI) imply absence of any serious collinearity among the selected variables. Multicollinearity could only be a problem if correlation coefficient between regressors is above 0.80 (Okere, 2018).

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**TABLE 3 Pearson Product Moment Correlation Matrix of Relationship between Operating Efficiency and Net Interest Margin (NIM)**

| | NIM | NICTA | NIITA | BSZE | OEOI |
|---|---|---|---|---|---|
| NIM | 1. | | | | |
| NICTA | .394** | 1 | | | |
| NIITA | -.466** | -.385** | 1 | | |
| BSZE | -.104 | -.383** | .707** | 1 | |
| OEOI | .526** | -.136 | -225* | .281** | 1 |

** Correlation is significant at the 0.01 level (2-tailed)

*.Correlation is significant at the 0.05 level (2-tailed)

**Source: Researchers Computations (2022) using E-Views 10**

**Pre-estimation Tests**

**Panel Unit Root Test of Stationarity**

The panel unit root test presented in table 4.3 shows the time series behaviour of each of the pool series at both cross-section and individual levels using the Augmented Dickey Fuller (ADF) Fisher Chi-square and the ADF-Choi Z Stat Tests.

**TABLE 4: Panel Unit Root Test for the Variables**

| | ADF-Fisher Chi-Square | | ADF-Choi Z-Stat | |
|---|---|---|---|---|
| Variables | Statistic | Prob.** | Statistic | Prob.** |
| NIM | 39.3773 | 0.0249 | -2.01934 | 0.0217 |
| NICTA | 42.4023 | 0.0116 | -2.96171 | 0.0015 |
| NIITA | 80.7933 | 0.0000 | -5.21050 | 0.0000 |
| BSZE | 38.5872 | 0.0302 | -2.23498 | 0.0127 |
| OEOI | 49.2791 | 0.0017 | -3.58397 | 0.0002 |

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality

**Source: Researcher's Computations (2022) using E-Views 10**

The results revealed that the net-interest margin (NIM), ratio of non-interest cost to total assets (NICTA), ratio of net interest income to total assets (NIITA), bank size (BSZE) and ratio of operating expenses to operating income (OEOI) were all stationary at level as indicated by the probability of ADF-Fisher Chi-squared values of 0.025, 0.012, 0.000, 0.03 and 0.002 respectively that are < 0.05 level of significance allowed for our estimation in the study. At the individual level, the corresponding probability values of 0.022, 0.002, 0.000, 0.013 and 0.000 produced by the ADF-Choi Z- Stat that are less than the allowed error margin of 0.05 for the estimates of the study also supports the stationarity of the operating efficiency indicators and net interest margin (NIM) variables.

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**Test of Hypothesis One**

The unit root test established the existence of stationarity among our variables of interest, thus indicating that the data are adequate for further treatment and analysis. Hypothesis one ($H_0$1) states that operating efficiency has no significant effect on net interest margin (NIM) of D-SIBs and D-NSIBs in Nigeria during the study period. Table 4.3 shows the results of the pooled, fixed and random effects panel regression of the effect of operating efficiency on the financial performance (NIM) of D-SIBs and D-NSIBs over the study period. As the explanatory variables gave similar effects of a linear relationship between financial performance (NIM) and operating efficiency under each estimation, the Hausman test (Table 5) compares the fixed and random effect models and suggests an appropriate choice between the fixed and random effect estimates. The Chi-square test statistic of 29.13 which is greater than the critical value of 9.48 (d.f 4) at .05 per cent level of significance ($p = 0.000 < .05$) indicates that the fixed effect model fitted better than the random effect for the effect of operating efficiency on net interest margin (NIM) as measure of financial performance of DMBs in Nigeria during the study period. Discussions are therefore centered on the fixed effect model.

**TABLE 5: Panel Least Squares Regression Results**

Dependent variables: NIM

| | Pooled Effect | | Fixed Effect | | Random Effect | |
|---|---|---|---|---|---|---|
| Variable | Coefficient | Prob. | Coefficient | Prob. | Coefficient | Prob. |
| C | 3.498730 | 0.0000 | 4.785117 | 0.0000 | 3.510448 | 0.0000 |
| LOGNICTA | 0.145053 | 0.1029 | -0.307855 | 0.0054 | -0.061119 | 0.5133 |
| LOGNIITA | 0.293080 | 0.0001 | 0.353663 | 0.0000 | 0.318138 | 0.0000 |
| LOGBSZE | 0.511289 | 0.0000 | -0.618258 | 0.0096 | 0.205568 | 0.1547 |
| LOGOEOI | -0.276482 | 0.0019 | 0.119186 | 0.2829 | -0.059422 | 0.5389 |
| | | | | | | |
| | | | | | S.D | Rho |
| | | | Cross-section random | | 0.068382 | 0.3509 |
| | | | Idiosyncratic random | | 0.093002 | 0.6491 |
| R-Squared | 0.539860 | | 0.763317 | | 0.559524 | |
| Adj. R.Sq | 0.523855 | | 0.729180 | | 0.533768 | |
| F-Statistic | 33.73103 | | 22.36037 | | 10.07637 | |
| Prob. (F. Statistic) | 0.000000 | | 0.000000 | | 0,000000 | |
| Durbin-watson Stat | 1.521177 | | 1.671477 | | 1.636097 | |

**Source: Researchers Computations (2022) using E-Views 10**

The fixed effects estimate, when heterogeneity effect of the different banks across the sample banks is incorporated into the intercept term, is reflectedin Table 4. Ratio of net interest income to total assets (NIITA) with coefficient of 0.354 ($P = 0.000; < 0.05$) shows positive significant effect on financial performance (NIM), the ratio of non-interest cost to total assets (NICTA), and bank

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size (BSZE), revealed negative significant effects with coefficients of -0.308 & -0.618 (P = 0.005 & 0.010; < 0.05) respectively. However, the ratio of operating expenses to operating income (OEOI) has positive insignificant effect on financial performance (NIM) with coefficient of 0.119 (P = 0.283; > 0.05). The reported fixed effect estimate Adj. R-square of 0.729 indicates that not less than 73 per cent of systematic variation in financial performance (NIM) can be explained jointly by the ratio of non-interest cost to total assets (NICTA), ratio of net interest income to total assets (NIITA), bank size (BSZE), and ratio of operating expenses to operating income (OEOI). Durbin-Watson (DW) statistic of 1.67 (approx. 2) implies the absence of any autocorrelation in the dataset that may give serious source of concern. F-statistic with coefficient of 22.36 (P = 0.000; < 0.05) indicates a positive significant relationship between the dependent variable (NIM) and the explanatory variables (NICTA, NIITA, BSZE and OEOI). H01 is therefore rejected.

**TABLE 6: Correlated Random Effects Hausman Test**

**Test Cross-Section random effects**

| Test summary | | Chi-sq. Statistic | Chi-Sq. d.f | Prob. |
|---|---|---|---|---|
| Cross section random | | 29.126265 | 4 | 0.0000 |
| Cross section random effects test comparisons | | | | |
| Variable | Fixed | Random | Var(Diff.) | Prob. |
| LOGNICTA | -0.307855 | -0.061119 | 0.003054 | 0.0000 |
| LOGNIITA | 0.353663 | 0.318138 | 0.000786 | 0.2052 |
| LOGBSZE | -0.618258 | 0.205568 | 0.034315 | 0.0000 |
| LOGOEOI | 0.119186 | 0.059422 | 0.002896 | 0.0009 |

**Source: Researchers Computations (2022) using E-Views 10**

**Test of Hypothesis Two**

Hypothesis two ($H_0$2) states that there is no significant difference between the financial performance of D-SIBs and D-NSIBs, measured by net interest margin (NIM), in Nigeria during the study period, 2011-2020. Operating efficiency was captured by ratios of non-interest cost to total assets (NICTA), net interest income to total assets (NIITA), operating expenses to operating income (OEOI), and bank size (BSZE).The One-way ANOVA test result is presented in Table 6 in relation to the DMBs' net interest margin (NIM), The F-statistic and probability values of 0.948 (p = 0.231; > .05) does not provide enough evidence to reject the null hypothesis of equality of means of net interest margin (NIM) between the two groups (D-SIBs and D-NSIBs). Hence, the financial performance of D-SIBs and D-NSIBs are deemed to be the same during the period under examination.

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**TABLE 7. ANOVA Test Results of Equality of Means in Financial Performance (NIM)**

| | Source of variation | Sum of squares | D.f | Mean square | F | p-value | Sig |
|---|---|---|---|---|---|---|---|
| Net Interest Margin % (NIM) | Between groups | 1033.358 | 10 | 103.336 | .948 | 0.231 | .166 |
| | Within groups | 11879.633 | 109 | 108.987 | | | |
| | Total | 12912.991 | 119 | | | | |

**Source: Researcher's Computations (2022) using E-Views 10**

**Post-Hoc Test**

The ANOVA test does not usually provide information about which group means are different. To understand which group means are different, we need to use the post-hoc multiple comparison test such as Turkey's test or Bonferroni test. However, if the ANOVA test (F-test) is not significant (i.e. $p > 0.05$) we do not need the post-hoc test. Hence, a further post-hoc test is not provided by the study.

## DISCUSSION OF FINDINGS

### Effect of Operating Efficiency on the Net Interest Margin (NIM) of D-SIBs and D-NIBs in Nigeria

The relationship between operating efficiency and net interest margin (financial performance) of the DMBs in Nigeria during the period of investigation is presented in Table 5. The F- statistics results from the fixed effect model as stipulated by the Hausman test conducted, show that operating efficiency has positive significant effect on net interest margin of Nigeria DMBs. On the basis of these results we reject the null hypothesis that "Operating Efficiency has no significant effect on net interest margin (NIM) of D-SIBs and D-NIBs in Nigeria over the period of study" and accept the alternative hypothesis.

Our findings from this objective can be interpreted to mean that only operationally efficiently run banks will have the ability to reduce operating costs (interest and non-interest) and achieve a higher net interest margin.

A notable aspect of our findings is that bank size has a negative significant effect on performance of banks. This result contradicts the study's *a priori* expectations and the result of Lotto (2019) and Hughes *et al*., (2013) that bank size has positive significant effect on operating efficiency. The common argument however, is that operating costs decreases as size of a bank increases up to a certain level and thereafter operating costs increase as the bank size increases beyond this point.

The result is however consistent with the argument by Hughes *et al*., (2013) those large banks are expected to be more efficient relative to smaller banks due to the fact that large banks are capable of mobilising resources (human, material and technological) to improve operating efficiency.
This argument is supported by the "economies of scale theory" that stipulates that a company enjoys a reduction in its average cost of production because of an increase in production output. When applied to the banking sector, a bank that is large in size is expected to enjoy economies of scale and produce its services at a lower cost per naira of total deposits. Large banks are therefore deemed to earn higher interest margin than smaller banks.

**Investigation of Differences in Financial Performance between D-SIBs and D-NSIBs in Nigeria during period of Study**

The ANOVA Tests results of equality of means in financial performance (NIM) between D-SIBs and D-NSIBs is shown in Table7. The test results have led us to conclude that there is no significant difference in the financial performance of both D-SIBs and D-NSIBs in Nigeria during the study period. Hence our initial null hypothesis that "There is no significant difference between financial health and performance of D-SIBs and D-NSIBs in Nigeria during the study period" is not rejected. The implication of this study outcome is that operating efficiency had positive significant effect on the financial performance of DMBs in Nigeria and that that the financial performance of both the D-SIBs and D-NSIBs in Nigeria over the period was similar. We are led to conclude by this result therefore, that the enhanced supervisory attention accorded the categorized D-SIBs is unnecessary. The study recommends, therefore, that bank managements should exercise due diligence in controlling operating costs and the supervisory and regulatory authorities should also pay equal attention to all banks without discrimination as all the DMBs have the potential to exhibit systematic importance in the long run. It was noted, however, that our results contradicts findings in Yusuf and Tijani (2019) who submitted that the financial health and performance of DMBs in Nigeria during the period 2010-2017, almost the same study period coverage, differ based on whether or not they were systematically important. According to Yusuf and Tijani (2019) the difference in performance was attributed to the closer monitoring and lighter regulatory surveillance on D-SIBs by the central bank of Nigeria (CBN).

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