EXPLORING THE RELATIONSHIP BETWEEN EFFICIENCY AND PROFITABILITYOF LISTED DEPOSIT MONEY BANKS IN NIGERIA

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ABSTRACT

Measurement of financial institutions performance has been done with the use of certain Key Performance Indicators (KPIs) such as liquidity ratio, profitability ratio, asset quality of the bank, capital adequacy amongst others. The study therefore, adopted a two-stage methodological approach (non-parametric and regression analysis) with the help of Microsoft excel solver and E-Views to analyze the efficiency and performance of eleven (11) listed deposit money banks. The study made use of three (3) inputs (total deposit, total asset, and operating expenses) and three (3) outputs (net interest income, loans and advances, and gross earnings) for the deposit money banks. From the data envelopment analysis, the study found that Eco Bank, Access Bank, First City Monument Bank, Fidelity Bank, Guarantee Trust Bank, Sterling Bank, Unity Bank, Wema Bank, were efficient at all envelopment models. At the same time, United Bank for Africa, Zenith Bank and Union Bank were not fully efficient at all envelopment models despite their profitability. From the profitability model, the study found that industry-specific variables were positive and statistically significant at 0.005 level of significance. The study concludes that big or large financial disclosures accrued to financial institutions does not secure its improved efficiency level which could metamorphose into financial stability. The result of this study has made it clear that efficiency is a better measure of performance than profitability as some deposit money banks were not efficient, but profitable, also a huge total asset is not directly proportional to an efficient financial institution; therefore, management of banks should introduce effective and cost efficient strategies as part of their strategic decisions.

Keywords: Efficiency, Data Envelopment Analysis, Performance, CRS, VRS

INTRODUCTION

An efficient banking sector's importance cannot be over-emphasized because of its importance in promoting sustainable economic growth, which would lead to the financial system development and a dynamic economic system (Fagge, 2019). Performance measurement has become a pivotal issue in the finance sector that has helped to identify efficient and inefficient companies (Jaloudi, 2019). The Nigerian financial sector has experienced tremendous growth since the 2007-2008 global financial crisis, and this development isbecause ofthe global policy measures to restore stability to the financial sector (Osuma, Babajide, Ikpefan, Nwuba & Jegede, 2019). An example of such global policy measures includes the introduction of the Basel III by members of the Basel committee in 2010 to strengthen the banking sector's supervisory, regulatory, and risk management system. However, this development in the financial sector called for continuous monitoring of the performances of this sector. In Nigeria, banks have thrived under different

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economic conditions which covered technological, political, cultural, and socio-economic changes to be abreast of one another and this competition has enabled banks to adopt methods of containing cost, rebranding their product, and deepening customers' relationship (Abel, Khobai & Roux, 2017; Worimegbe, Abosede & Worimegbe, 2018; Worimegbe, Oladimeji & Eze, 2019).

There are two main approaches used in the evaluation of bank performance, these include the frontier technique (approach) and financial ratio analytical approach. The financial ratio approach bases its measurement on financial indices such as liquidity ratios, profitability ratios, and the banks' credit quality (Samad, 2004). The financial ratio approach has a drawback of its lack of consensus from academics about the portent combination of financial ratios and their weighting in the bank efficiency analysis (Yang, 2012). The frontier analysis involves both the parametric and non-parametric approaches, which are used to determine an efficiency frontier of the various decision-making units after the assignment of relative efficiency scores. Chen (2001), as cited in (Olanrewaju & Obalade, 2015) stated that efficiency could be measured in three phases, which include scale, scope, and operational efficiency. Scale efficiency ensures that the bank maintains its constant rate of returns, while scope efficiency deals with how it increases its location. However, operational efficiency deals with the efficient utilization of people and material resources. The level of growth in the banking industry's efficiency can be attributed to the advent of technology, improved managerial competencies, style, and knowledge. The need to continuously evaluate efficiency levels in the banking sector is a result of competitive pressure within the sector and the investors as well as the customers' expectations.

Over the years, financial ratios have been used by regulators to measure and/or evaluate the overall efficiency, performance and soundness of financial institutions, as it is believed that after the financial evaluation of deposit money banks and other financial institutions with the CAMELS rating which is an acronym for capital adequacy, asset quality, management efficiency, earnings capacity, liquidity and market risk sensitivity, the sector ought to move from a striving sector to a thriving sector but, the reverse seems to be the case because these sectors have shown to be highly subjected to contagion effect otherwise known as systemic risk where little or huge financial shock poses a systemic threat to the Nigerian financial system with the banking sector being the most hit from the shock. Thus, financial ratios do not measure the managerial capacity of converting inputs into outputs in the same organization. How more efficient can a bank be if it cannot withstand both internal and external shocks that tend to pose a systemic threat to its financial system thus the rationale for this study in examining both efficiency and profitability in DMBs performance. This paper consists of the introduction, literature review, methodology and theory, data analysis and presentation of results, conclusion and recommendation, acknowledgement, and references.

LITERATURE REVIEW

Ali and Bahram (2020) examined how technological performance and total factor output is affected by various aspects of board diversity. The analysis assessed the board's composition from two dimensions: the partnership dimension (gender and age) and the mission dimension (expertise, education, and tenure) usage of balanced panel data for eight hundred and six (806) Chinese non-financial companies over the 2009 to 2017 period. For research, they used a two-stage technique. In the first point, to measure the technological efficiency and factor productivity ratings, which made use of the non-parametric frontier technique. The study reduced the ratings on board diversity attributes in the second level (task-related diversity and relation-related diversity). The study found that board diversity increases technological performance and total factor competitiveness by using two-step method GMM and Tobit regression. Our studies demonstrate that corporate board diversity (in terms of ethnicity, age, tenure, expertise, and experience) positively affects corporate

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performance. According to Abiola & Olaniyan (2020), financial services have encountered a diverse and challenging climate and Islamic banking is one of the fastest developing sectors. They further opined that there are few established studies on Islamic banks productivity in Nigeria, considering the significant growth of the Islamic banking sector. The research analyzed Nigeria's Islamic banking system's efficacy compared with the conventional or traditional banking using the DEA approach. The study findings showed that, with an efficiency score of 98.25 percent and 73.18 percent for pure technical efficiency and total technical efficiency, the chosen Islamic bank is efficient. The Islamic bank has also appeared on an efficient frontier, showing that their financial resources have been handled effectively for many years. The findings showed that the Islamic bank selected (JAIZ bank) was successful in the face of close competition from other traditional banking counterparts. The study proposed that Islamic banking be included in Nigeria's search for global financial stability.

In Indonesia, Yumna (2020) examined the x-efficiency of fifteen commercial banks consisting of seven (7) syariah and eight (8) traditional banks. Three (3) phases of data processing were used in this research: non-parametric Data Envelopment Analysis (DEA) method, t-test, and multiple regression methodology. The findings showed that both the syariah as well as traditional banks in Indonesia did not achieve an optimum level of productivity in the span of this analysis. However, traditional banks, relative to syariah banks, obtain a higher degree of allocative and absolute efficiency. Instead of technological challenges, the inefficiency of Islamic banks derives from allocative inefficiency. The X-efficiency of the bank is greatly impacted by the scale rather than the amount of banking outlets and employees' expense. Fukuyama, Matousek & Tzeremes (2020) developed a two-stage model to examine Turkish banks' cost inefficiencies from 2007 through 2016. To analyze the approximate Nerlovian cost inefficiency to the sum of slack based technological and allocative inefficiency amounts, the analysis used Koopmans notion of input efficiency. In addition to the conventional inputs, outputs and intermediates used to model the banks efficiency calculation, the analysis also applied the efficiency element of labor education as a non-discretionary variable. This facilitated the simulation of how human capital considerations impact the revenue generation stage of a bank. The study's outcome showed that the levels of cost inefficiency are influenced particularly by a bank's capacity to monitor allocative inefficiency level. Empirically shown by the improved performance of international banks, this suggested that the calculation of cost performance was important for bank ownership structures. Conclusively, the global financial crisis of 2008 revealed that it had anadverse effect on the bank’s capacity to minimalize their cost inefficiency rate. Nonetheless, the aftermath of the crisis showed that Turkish banks have begun to rebound from the adverse consequences, primarily through better allocation efficiency.

Wasiaturrahma, Raditya, Shochrul, Cahyaning & Ahmad (2020) evaluated the performance efficiency ofIslamic rural banks and traditional banks in Indonesia, particularly Bank Pembiayaan Rakyat Syariah (BPRS) and Bank Perkreditan Rakyat (BPR). The research used efficient data envelopment analysis technique. From the study findings, it indicated that both Bank Perkreditan Rakyat and Bank Pembiayaan Rakyat Syariah are efficient in terms of production while inefficient in terms of the intermediation role. Subsequently, the Tobit estimation showed that these 2 efficiencies results are positively affected by the Capital Adequacy Ratio (CAR) and location. Rural banks working in cities have also been shown to appear to have a higher degree of productivity than elsewhere. Moreover, in terms of development and intermediation, the greater the money, the more productive both Islamic and traditional rural banks are. Although the banking sector's absolute performance has always been a foremost concern to the regulators, it is now of utmost significance to researchers, the public, and policymakers alike. Managers of banks and other financial

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institutions such as insurance companies seek ways to improve efficiency and profitability since it is the core of banking industry goals globally. It comes in different phases (Worimegbe et al., 2019).

Evaluation of banks and other financial institutions performance efficiency varies depending on the evaluator's perspective. Some evaluators may be more concerned about the bank's potential loan loss, profit after tax, capital adequacy ratio, net interest margin, and so on. Bank's shareholders are more concerned about the bank's profitability and dividend payment, while depositors are more concerned about the banks' solvency, liquidity, and safety. Although each category of evaluators has their specific motivation, they are all moved by the general motivation to evaluate the banks' performance. By evaluating a bank's performance, the internal structure of the bank is explored, which helps identify the root cause of poor performance (Shah, Wu & Korotkov, 2019). Duncan & Elliot (2004), averred that efficiency aims to increase financial performance by reducing cost, increasing customers' satisfaction, and earning, which in the long run, improves banks' financial performance. Alshammari (2017) study found that the 2008 global financial crisis from the subprime lending affected commercial banks' performance, but not the Islamic banks in Kuwait, Saudi Arabia and United Arab Emirate.

Mollah, Hassan, Farooque & Mobarek, (2017) investigated whether governance structures differences influence the performance of Islamic banks' than commercial banks. The study used a sample of a hundred and four (104) conventional banks and fifty-two (52) Islamic banks in fourteen (14) countries from 2005 through 2013. The study concluded that Islamic banks governance structure plays a crucial role in their financial performance and helped Islamic banks to achieve better performance when compared to the conventional banks. Olweny & Shipho (2011) considered the CAMELS approach to determine the relationship between bank's performance and capital adequacy. The study found that banks get more efficient as they increased their capital base. The study of Aguenaou, Lahrech & Bounakaya (2017) evaluated the CAMELS approach's six components to Moroccan bank performance. For this study, emphasis is given to the capital adequacy which stands for "C" in the acronym. The capital adequacy ensures meeting a substantial part of the minimum of the capital requirement will enhance efficiency and the inability to meet the minimum requirement causes inefficiency since the owner's control over the management is not secure. The study accessed from the Moroccan context the determinant of the financial efficiency of Six (6) listed banks on the Casablanca stock exchange for the period of eleven years spanning from 2004 through 2014. They used the CAMEL framework as the independent variable. The study found that only "M," which stands for management efficiency from all the acronyms, had a positive and significant influence on the selected banks. The other acronyms had a negative influence on the banks performance. The study of Eriki & Osifo (2015) carried out a different study from their 2014 research by examining the determinants of efficiency in the Nigerian Banking industry, considering nineteen (19) banks in Nigeria. Their findings revealed that the independent variables, such as bank size and age, positively influence the efficiency of Nigerian banks. In contrast, board independence and the ownership structure had a negative impact on banks' performance in Nigeria. Their study recommended that an efficient and robust management of risk policies should be put in place. Also, the regulatory and supervisory functions of monetary policies should be rigorously pursued.

Omankhanlen & Adegbite (2018) examined the post-2005 consolidation effects on the Nigerian banking sector's efficiency from the year 2005 through 2009. The study showed that none of the study's banks produce up to fifty (50) percent total efficiency in any of the years under study. Even after the consolidation era, many of the banks did not record full efficiency. Therefore, there is a need to formulate and put in use better monetary policies that will improve these banks' performances, including their efficiencies. Osadume & Ibenta (2018) investigated some selected banks' financial performance in Nigeria for fourteen (14) years spanning from 2001 through 2014. The study considered net profit as the dependent variable. In contrast, capital adequacy, liquidity

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and assets quality as independent variables on short-term and long-term basis revealed that the proxies for independent variables had a significant effect on the selected deposit money banks' financial performance. Therefore, net profit should not be the only basis for assessing the banks performance. The study recommended that necessary regulatory standards and framework be adhered to in evaluating banks' performance in Nigeria.

Fakarudin, Fadzlan, Annuar, Nazratul & Hafezali (2019) investigated the Malaysian Islamic banking sector's sales performance. The study explored the possible bank-specific (internal) and macroeconomic (external) determinants influencing Malaysian domestic Islamic banks' revenue performance. In analyzing the possible determinants of sales performance, a panel regression analysis was adopted. As opposed to their international Islamic bank counterparts, the results revealed that Malaysian domestic Islamic banks' level of revenue efficiency is lesser. The strength, liquidity, and management quality of the bank sector also significantly affect the improvement in Malaysian domestic Islamic banks' income performance during the time under review. For the first time, this research presented empirical data covering all three (3) efficiency principles, including expense, benefit, and benefit efficiency. The measurement of these efficiency principles can observe the efficiency standards of domestic and global Islamic banks. The effect of sales performance on banks' profitability can be definitively defined by comparing both cost and benefit efficiency.

Table 1
VARIOUS TYPES OF EFFICIENCY

Efficiency Type	Definition Relating to Banking
Transactional Efficiency	Using banks as a case study, transactional efficiency measures bank-client relationships which means how productive these new distribution channels are, such as Automated Teller Machine (ATM), Mobile banking, Internet banking and the Point of Sale (POS) channels of the bank. However, the transactional efficiency output measures the level of customer's patronage of these distribution channels and the amount of income generated through these channels. Transactional efficiency aims to ensure that the customers switch to these new distributional platforms of payment and settlement to avoid or reduce human errors in payment processes. The more financial institutions achieve transactional efficiency, the more competitive advantage they realize just as banks that are more technologically inclined often times have more customer base than their competitors.
Operational efficiency	Operational efficiency measures performance and productivity in terms of sales. It estimates how a firm's product has been produced, stored and distributed efficiently (Portela & Thanassolious, 2007; Olanrewaju & Obalade, 2015). Without operational efficiency, an organization can find it difficult to survive the evolving economic conditions since its major objective is to maximize profit and shareholder wealth. Operational efficiency is crucial for a bank's survival, which calls for the evaluation of banks' input and output since many organizations from different sectors rely solely on banks for survival. According to Olanrewaju & Obalade (2015), operational efficiency involves tactical planning that helps to balance the cost and productivity of an organization. Operational efficiency ensures that cost and wastages are minimized to improve revenue and benefits to improve customer satisfaction. Operational efficiency occurred when the right set of people, processes, materials, and technology are combined to enhance business operations' value and productivity. Operational efficiency identifies the areas of wastages in an organization that can impede profit and organizational resources. It enhances cost reduction to improve production or maintains the same level of production.
Technical efficiency	A financial institution is said to be technically efficient when it can achieve maximum output from a given combination of inputs or when it can use the minimum level of inputs to produce an equivalent level of output (Asmare & Begashaw, 2018). A bank is technically efficient if it produces maximum outputs from a minimum quantity of inputs, capital, labor or technology.
	This is a macroeconomics concept that assesses a firm's financial performance on how its actual profits would be compared with certain best-practice (benchmarking) frontiers.

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Profit Efficiency	Specifically, profit efficiency is the overall form of efficiency, in such a way that once a bank or company is efficient in its profit, it would also be efficient in its costs and production scale (Fitzpatrick & McQuinn, 2008) as cited in (Pilar, Marta & Antonio, 2018)
Efficiency Ratio	This is simply defined as the banks sets of outputs divided by the bank's sets of combinations of inputs. In other words, during the analysis and interpretation, to calculate the efficiency of each decision-making units, the weighted sum of the DMUs output (total output) would be divided by the weighted sum of the DMUs inputs (total input).

Source: Authors computation 2021

Theoretical Review

The research anchors on the x-efficiency hypothesis propounded by Leibenstein (1966). The theory argues that banks that have better corporate governance practice, manage their operational expenses (inputs) tend to raise their profit level and move banks closer to the efficient frontier. Under the "x-efficiency" an efficient bank is profitable because of their reduced operational costs. These banks gain a larger market share which commensurate to an improved bank concentration level. The causal relationship between profitability and concentration is not considered here. The underlying assumption of the x-efficiency theory includes low productivity can occur because of the focus of the work of top managers. The focus of top managers is aimed at the commercial and financial affairs (Leibenstein, 1966).

METHODOLOGY AND THEORY

The scale efficiency hypothesis explains economies of scale can be achieved by big or large sized institutions leading to reduced cost and increased profits which may enable the large banks to proliferate more thereby gaining more market share, which result in increased profitability and concentration (Olweny & Shipho, 2011). Reduced operation cost leads to a more than proportionate increase in profits and fast growth for a bank classified as scale efficient. The model for this study is specified in both the implicit and explicit form in equation 1 and 2, the sample size of the study constitutes eleven (11) deposit money banks in Nigeria. The eleven listed deposit money banks used for the study include First City Monument Bank Plc, Access Bank Plc, United Bank for Africa Plc, Fidelity Bank Plc, Guarantee Trust Bank Plc, Sterling Bank Plc, Zenith Bank Plc, Wema Bank Plc, Unity Bank Plc, Union Bank Plc, and Eco Bank Plc Table 2.

Performance Model

$$NII = f(OP, lnLOA, TD, INFL, MPR) \quad \ldots \quad \text{eq (1)}$$

$$NII = \beta 0 + \beta 1 OPit, + \beta 2 lnLOAit, + \beta 3 TDit, + \beta 4 INFLit, + \beta 5 MPRit + \mu \quad \ldots \quad \text{eq (2)}$$

Where;
NII: net interest income.
LnLOA: natural logarithm of loans and advances.
TD: total deposit.
INFL: Inflation rate
MPR: monetary policy rate.
OP: Operating expenses

Efficiency Model Operationalized

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DMUs (Banks), can be denoted as DMUj, j= 1,…,n
Inputs (total deposit,total asset, and operating expenses), can be denoted as xij, i= 1,…m
i= 1, …,m for inputs (m is the number of inputs)
jth DMU's ithinput
5th DMU's 3rd input: X35
Outputs (net interest income, loans and advances, and gross earnings), can be denoted as yrj, r= 1,…, s
=r= 1,…s, for outputs (s is the number of outputs)
jth DMU's rth output
6th DMU's 3rd output: Y36
The values on these inputs and outputs are known – they are observations (although they are expressed in symbols in the DEA models)
Inputs (m= 1, 2, 3; b= 3)

- Total deposit
- Total Asset
- Operating expenses

Outputs (s= 1, 2, 3; p= 3)

- Net interest income
- Loans and advances
- Gross earnings

DATA ANALYSIS AND INTERPRETATION OF RESULTS

This section consists of the descriptive statistic for Net Interest Income (NII) model for deposit money banks to give a succinct summary of the data set which is the representation of the population sample. the correlation matrix for multicollinearity was conducted to examine if there is an incidence of multicollinearity and this was further corroborated with the variance inflation factor to ensure that no two or more independent or explanatory variable in the regression model are highly related linearly. After the test for multicollinearity, a pooled ordinary least square was conducted, followed by the fixed and random effect regression, for the net income model (NII) a Hausman test was also conducted to determine the appropriateness of either the fixed or random effect models and the result showed that the random effect model is suitable because the value of the probability of 0.2428 is greater than 5% showing that the independent variable are not statistically significant, also the efficiency scores of the deposit money banks is shown in table 4.8.

Table 2
SUMMARY/ DESCRIPTIVE STATISTICS

	NII	OP	lnLOA	TD	INFL	MPR
Mean	37640642	-9.81E+05	15.98641	4.76E+08	11.73455	11.61364
Median	211646	9.06E+04	14.28315	2079862	11.8	12
Maximum	2.99E+08	1.35E+08	21.92895	5.92E+09	18.6E+01	14
Minimum	-438602	-3.88E+08	11.26626	0	8	6
Std. Dev	67632521	7.30E+07	3.31659	1.12E+09	2.957121	2.769439
Skewness	2.098267	-3.60E+00	0.358641	3.200595	0.911318	-3.59843
Kurtosis	6.84591	1.77E+01	1.521287	13.45807	3.404127	17.73835
Jargue-Bera	163.3597	1.36E+03	12.60506	757.9968	17.57182	1356.278
Probability	0	0.00E+00	0.001832	0	0.000153	0

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Sum	4.55E+09	-1.19E+08	1790.478	5.77E+12	1419.88	-1.19E+08
Sum Sq. Dev.	5.49E+17	6.39E+17	1220.974	1.50E+20	1049.348	6.39E+17
Observations	121	121	121	121	121	121

Source: E-Views 2021.

Table 1 Which is the summary statistics of all variables employed in this study includes both the variability measures (standard deviation, minimum, maximum, variance and kurtosis) and the central tendency measures (mean, median and mode). The mean of net interest income (NII) is 37640642 and ranges from -438602 to 2.99E+08, the mean of operating expense (OP) is -9.81E+05, which ranges from -3.88E+08 to 1.35E+08. The mean of the natural logarithm of loan and advance (lnLOA) is 15.98641, and it ranges from 11.26626 to 21.92895. The mean of total deposit (TD) is 4.76E+08, and it ranges from 0 to 5.92E+09. The mean of inflation (INFL) which is a macroeconomic variable is 11.73455, and it ranges from 8 to 18.6. While the mean of monetary policy rate (MPR) is 11.6 which ranges from 6 to 14.

Table 3
CORRELATION MATRIX

	OP	**lnLOA**	**TD**	**INFL**	**MPR**
OP	1	-0.09057	-0.58514	0.03799	-0.1038
lnLOA	-0.09057	1	0.613852	0.188948	0.167278
TD	-9.06E-02	0.613852	1	0.022313	0.213681
INFL	0.03799	0.188948	0.022313	1	0.213681
MPR	-0.1038	0.167278	0.213681	0.213681	1

Source: E-Views 2021.

The correlation matrix in table 3 shows the relationship amongst all the independent variables used in the study and it can be deduced that operating expenses (OP) is negatively correlated with the natural logarithm of loan and advances (lnLOA), total deposit (TD), and monetary policy rate (MPR) at -0.09057, -9.06 and -0.10 respectively while the same operating expenses is positively correlated with only inflation at 0.03. The natural logarithm of loan and advances is positively correlated with total deposit (TD), inflation (INFL), and monetary policy rate (MPR). Total deposit is positively correlated with both inflation and monetary policy rate at 0.02 and 0.21 respectively, while inflation (INFL) is positively correlated with monetary policy rate (MPR). The correlation matrices test indicates that the independent variables met the assumption of no perfect multicollinearity which stipulates that there should be no perfect relationship among the independent variables in the model, it is observed that none of the variables were above 80% (*i.e.*, > 0.8), meaning that there is no incidence of multicollinearity from the variables but this claim is further confirmed with the variance inflation factor in table 4 which also test for multicollinearity.

Table 4
VARIANCE INFLATION FACTOR

	Coefficient	**Uncentered**	**Centered**
Variable	Variance	VIF	VIF
OPERATING_EXPENSES	0.001675	2.014814	2.014735
TOTAL_DEPOSIT	6.43E-06	2.260419	2.247612
LNLOANS_AND_ADVANCES	1.59E+12	4.880401	1.709755
MPR	3.00E+11	1.470998	1.156681
INFLATION_RATE	2.40E+11	1.316682	1.052528
C	5.23E+14	4.191228	NA

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Source: E-Views 2021.

From table 4 the Variance Inflation Factor (VIF) was further carried out to test the authenticity of the correlation matrix result in terms of determining if there is an incidence of two or more predictor variables significantly affecting the dependent variables in similar direction. From the VIF thumb criteria, a value of 1 connotes not correlated, values that falls within 1-5 are moderately correlated while, values greater than 5 are highly correlated. From the variance inflation factor table in table 4, it can be inferred none of the variables are above 5 meaning there exist no evidence of multicollinearity with the variables.

Table 5
POOLED ORDINARY LEAST SQUARE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Operating_Expenses	0.050165	0.054362	0.922791	0.3582
Total_Deposit	0.046222	0.004529	10.20638	0
Lnloans_and_Advances	4418647	1277552	3.458682	0.0008
MPR	713623.5	1131036	0.630947	0.5294
Inflation_rate	462629.6	1055850	0.438158	0.6622
C	-67419655	25109231	-2.685055	0.0084
R-squared	0.798842	Mean dependent var		40644458
Adjusted R-squared	0.789354	S.D. dependent var		69445109
S.E. of regression	31872691	Akaike info criterion		37.44448
Sum squared resid	1.08E+17	Schwarz criterion		37.59011
Log likelihood	-2090.891	Hannan-Quinn criter.		37.50357
F-statistic	84.18986	Durbin-Watson stat		0.302517
Prob(F-statistic)	0			

Source: E-Views 2021.

Table 5 shows the pooled ordinary least square table and, from the panel least square results for operating expenses, it was observed that a unit increase in operating expenses will lead to about 0.050 increase in the dependent variable (net interest income). With a p-value of 0.3582, it can also be noted that operating expenses is not statistically significant to the model at 5%significance level. A unit increase in total deposit would make net interest income increase by 0.046%. with a p-value of 0.0000, it can be deduced that total deposit is significant at 5% level of significance (*i.e.*, 0.0000 < 0.005). If the logarithm loan to advances increase by 1% it will bring about a 4,418,647 increase in the dependent variable. With a p-value of 0.0008, it can be deduced that the logarithm of loans and advances is statistically significant at 5% level of significance. Monetary policy rate and inflation rate are not significant. As could be seen, a percentage changes in Monetary policy rate (MPR) would lead to an increase in net interest income by 713,623.5. Thus, holding all variable constant the profitability of deposit money banks remains negative. In this wise, other policies such as the prudential guidelines and an efficient adoption of Basel III will bring about a notable effect on the banks profitability. The coefficient of determination (r2) is 0.79 which indicate that 79% of the total variation in the dependent variable is explained by the total variation in the independent variable, while the remaining 21% can be explained by other variables not captured along the regression line termed as outliers.

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Table 6 FIXED EFFECT MODEL				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
OPERATING_EXPENSES	-0.156113	0.042084	-3.709567	0.0003
TOTAL_DEPOSIT	0.04451	0.002545	17.48968	0
LNLOANS_AND_ADVANCES	-3491884	1325544	-2.634304	0.0098
MPR	1657697	549756.2	3.01533	0.0033
INFLATION_RATE	411455.5	489463.3	0.840626	0.4026
C	49378928	21145369	2.335212	0.0216
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.961081	Mean dependent var		40644458
Adjusted R-squared	0.955	S.D. dependent var		69445109
S.E. of regression	14731552	Akaike info criterion		35.98045
Sum squared resid	2.08E+16	Schwarz criterion		36.3688
Log likelihood	-1998.905	Hannan-Quinn criter.		36.13801
F-statistic	158.044	Durbin-Watson stat		1.125345
Prob(F-statistic)	0			

Source: E-Views 2021.

From the panel least square results for fixed effect model in table 6, it was observed that an increase in operating expenses would produce about 0.156 unit decrease in net interest income (NII). With a p-value of 0.003, it can be inferred that operating expenses is statistically significant to the model at 5% level of significance. A unit increase in total deposit would lead to an increase in net interest income by 0.044%, and it is statistically significant at 5% level of significance. If the logarithm of loan to advances increase by 1% it will bring about a 3,491,884 unit decrease in NII. MPR is statistically significant at 5 per cent level, while inflation rate is not statistically significant. As could be seen, a percentage changes in MPR would lead to an increase in net interest income by 411,455.5 units. Thus, the coefficient of determination is 0.96 which indicate that 96% of the total variation in the dependent variable is explained by the total variation in the independent variable.

Table 7 RANDOM EFFECT MODEL				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
OPERATING_EXPENSES	-0.132172	0.040925	-3.229652	0.0017
TOTAL_DEPOSIT	0.044677	0.002535	17.62073	0
LNLOANS_AND_ADVANCES	2441292	1259100	-1.938919	0.0052
MPR	1539150	547497.9	2.811244	0.0059
INFLATION_RATE	421378	489407.9	0.860995	0.3912
C	32242349	22860380	1.410403	0.1613
	Effects Specification			
			S.D.	Rho
Cross-section random			36720755	0.8614

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Idiosyncratic random			14731552	0.1386
	Weighted Statistics			
R-squared	0.887183	Mean dependent var		4950408
Adjusted R-squared	0.881862	S.D. dependent var		43192759
S.E. of regression	14850256	Sum squared resid		2.34E+16
F-statistic	166.7157	Durbin-Watson stat		1.00337
Prob(F-statistic)	0			
	Unweighted Statistics			
R-squared	0.659675	Mean dependent var		40644458
Sum squared resid	1.82E+17	Durbin-Watson stat		0.128746

Source: E-Views 2021.

Table 7 the panel least square results for random effect model, it indicates that an increase in operating expenses will be commensurate to about 0.132 unit decrease in net interest income. With the p-value of 0.0017, it shows that operating expenses is statistically significant to the model at 5% level. Also, total deposit increases by 1%, net interest income increases by 0.0446%. If the logarithm loan to advances increase by 1% it will bring about a 2,441,292 unit decrease in NII. MPR is statistically significant at 5% level, while inflation rate is not statistically significant to the model. As could be seen, a percentage changes in MPR lead to an increase in net interest income by 1,539,150 units. Thus, holding all variable constant the variable the profitability of deposit money banks remains negative. In this wise, other policies such as the prudential guidelines and an efficient adoption of Basel III would bring about a notable effect on deposit money banks profitability. The coefficient of determination is 0.88 which indicate that 88% of the total variation in the dependent variable is explained by the total variation in the independent variable. It can be concluded that jointly the variables are statistically significant in the model.

Table 8
HAUSMAN TEST

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.714422	5	0.2428

Source: E-Views 2021

In table 8 a correlated random effect hausman test was done to choose which of the estimated models should be accepted under a null hypothesis, and an alternative hypothesis. The null hypothesis specifies that Random Effect model is suitable, alternative hypothesis specifies that fixed effect model is suitable. In this case the random effect model is suitable because the value of the probability of 0.2428 is greater than 5% showing that the independent variable is not statistically significant. From the random effect regression in table 8 all the industry specific variables which includes operating expenses, total deposit, loan and advances and monetary policy rate were statistically significant with the net interest income.

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Table 9
DEPOSIT MONEY BANKS EFFICIENCY SCORE AT VARIOUS LEVELS

DMU's	Efficiency Input-Oriented (VRS)	Efficiency Input-Oriented (CRS)	Efficiency Output-Oriented (VRS)	Efficiency Output-Oriented (CRS)
Access Bank	1	1	1	1
Eco Bank	1	1	1	1
Fidelity Bank	1	1	1	1
First City Monument Bank	1	1	1	1
Guarantee Trust Bank	1	1	1	1
Sterling Bank	1	1	1	1
United Bank for Africa	0.806496	0.789307	1	1
Union Bank	1	0.774337	0.858493	0.97193631
Unity Bank	1	1	1	1
Wema Bank	1	1	1	1
Zenith Bank	0.933103	1	1	1

Source: Excel solver 2021

Table 9 comprises of the eleven (11) listed deposit money banks efficiency score at various envelopment models. It can be deduced that first city monument bank, Access bank, Eco bank, Fidelity bank, Guaranty trust bank, Sterling bank, Unity bank, and Wema bank were all efficient at both the input and output-oriented envelopment models for Constant Return to Scale (CRS) and Variable Return to Scale (VRS). While United bank for Africa was efficient at the output-oriented constant return to scale and output-oriented variable return to scale, Union bank was only efficient at the input-oriented variable return to scale, having an inefficient score of 0.77, 0.85, 0.97 for input-oriented constant return to scale, output-oriented variable return to scale and output-oriented constant return to scale, respectively. Lastly, from table 9, Zenith bank PLC was efficient at all return to scale (including input-oriented constant return to scale, output oriented-variable return to scale, and output oriented constant return to scale) except input-oriented variable return to scale that zenith bank was not efficient with an efficiency score of 0.93.

CONCLUSION AND RECOMMENDATION

Therefore, it can be deduced that the effective management of market and credit risks could automatically translate into improved returns. The impact of size on deposit money banks continues to be ambiguous with mixed results where some large financial institutions were more efficient than small financial institutions vice-versa (Yue 1992; Maudos et al., 2002; Jemric & Vujcic, 2002; Luo, 2003; Sufian, 2007; Usman & Akinlo, 2009; Rakshit, 2019). Some financial institutions respond positively to their size, while the same size may inversely affect financial institutions performance and their financial stability because as the size of the financial institution increases, operational cost also increases.

The dual methodology employed helped to provide a robust conclusion that can be relied upon as well as validated. This study further suggests that a recapitalization of the listed deposit money banks minimum paid up capital should be imminent which would lead to the maintenance of a high level of capital adequacy to further improve their performance, efficiency, and financial stability. The study also suggests that management quality plays a significant role in determining the level in which financial institutions inputs are utilized as an efficient management is highly significant.

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