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Operational Risk and Performance of Listed Deposit Money Banks in Nigeria: The Moderating Effect of Bank Size

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Abstract
Deposit money banks performance has become a major concern for economists and policy makers because of their role in financing economic activities and their poor financial performance that can lead to failure and financial crunch which have undesirable impacts on the economic growth. The study examined the moderating effect of bank size on the relationship between operational risk and performance of listed deposit money banks (DMBs) *in Nigeria. Data were collected from audited financial reports of selected thirteen (13) listed DMBs in Nigeria over the period of 2014 to 2020. Panel data approach was employed and fixed effects estimate was used for hypothesis testing after the Hausman test was run. The variables used are Banks performance measured by net interest margin, operational risk proxied by cost to income ratio, with Bank size as moderator. The study found that cost income ratio has significant negative effect on profitability of listed DMBs in Nigeria measured by net interest margin at 1% level of significance. However, the study recommends that DMBs should estimate the probability of an operational loss event occurring and the possible effect on bank financial performance on a quarterly basis, as well as implement appropriate internal reporting practices and procedures that are aligned with the scope of operational risk identified by supervisors and the banking industry as a whole.*

Keywords: Bank Size, Moderator, Operational Risk
JEL Classification: D81, E51, G21

1. Introduction

The performance of deposit money banks according to Arif, Khan and Iqbal (2013), has become a major concern for economists and policymakers because of their role in financing economic activities. DMBs are the primary source of debt financing for both commercial and non-commercial enterprises. As a result, the stability of the banking industry is important to the financial system because it plays an important role in the operation of an economy. Furthermore, poor financial performance of deposit money banks can lead to failure and financial crunch, both

of which have negative effects on economic growth (Ongore & Kusa, 2013). However, in the aftermath of the failures of some large corporations, such as Enron and WorldCom, as well as the 2008 financial crisis, there has been an increase in research as to the root cause of these loss events and surprisingly, many studies have linked these failures to ineffective operational risk management (Chernobai, Jorion, & Yu, 2011).According to Chernobai, Jorion, and Yu (2011); several high-profile losses have been linked to operational risk, for example, Societe Generale, one of Europe's leading financial services groups and a major player in the economy for over 150 years lost $7.2 billion in 2008largely due to lack of internal controls and unmanaged operational risks.

Despite the Central Bank of Nigeria's 2010 crackdown on fraudulent bank executives, cases of fraud are on the rise in the Nigerian banking sector (CBN, 2010). Evidence shows that between 2014 and 2017, the industry lost N12.30 billion in more than 41,461 fraud cases (Okogba, 2018), in 2014, there were 1,461 fraud cases, 10,743 in 2015, 19,531 in 2016, and 25,043 in 2017. For fraud cases related to mobile and payment, the industry lost N6.22 billion in 2014 on an attempted fraud value of N7.76 billion, while N2.26 billion in 2015 on an attempted fraud value of N4.37 billion, and N2.19 billion in 2016 on an attempted fraud value of N4.37 billion (Okogba, 2018). According to reports on fraud cases, there was a 28% increase in 2017 compared to 2016, but with less financial loss. However, Automated Teller Machine (ATM) fraud was the most prevalent in 2017, accounting for a total loss of N497.64 million and a fraud volume of 9,823 (Okogba, 2018). Furthermore, CBN (2018) reported that, cases of bank fraud and forgery increased to 25,029 at the end of December 2018 from 20, 774 at the end of June 2018, with the total amount involved falling to N18.94 billion from N19.77 billion in the same period. The Central Bank of Nigeria sanctioned four Nigerian DMBs (Standard Chartered, Stanbic IBTC, Citibank, and Diamond) between 2007 and 2015 for various forgeries in foreign exchange transactions. They are to refund N5.87 billion to the central bank as a result of these violations (Nelson, 2018). According to Nelson (2018), the investigations specifically revealed that Standard Chartered Bank repatriated $3.45 billion on the basis of illegally issued Certificates of Capital Importation (CCIs). Between 2007 and 2015, Stanbic IBTC Nigeria, Citibank Nigeria, and Diamond Bank Plc repatriated $2.63 billion, $1.76 billion, and $348.9 million respectively. According to Adesoji (2019), the Nigerian banking industry lost N15.15 billion in 2018 due to cybercrime and forgeries. This was 539% more than the N2.37 billion recorded in 2017.

A thorough review of the literature reveals that, there is empirical studies dearth on the effect of operational risk on the financial performance of DMBs in Nigeria, and the few studies that have been conducted have produced inconsistent results. For example, studies by Fadun and Oye (2020), Olalere, Aminul, Yusoff, and Shamsuddin (2018), Ng'aari (2016), Epetimehim and Obafemi (2015), Siminyu, Clive, and Musiega (2016) found that operational risk had a significant positive effect on bank performance, whereas studies by Muriithi and Waweru (2017), Muriithi and Muigai (2017), Meshack and Mwaura (2016), Muriithi (2016) showed significant negative effect of operational risk on banks performance.

Because of these inconsistencies in the findings, it is necessary to include a moderator in the current study as opined by Baron and Kenny (1986). Moderator is a "variable that affects the direction and/or strength of the relationship between an independent or predictor variable and a dependent or criterion variable (Baron & Kenny, 1986). Consequently, bank size is the moderating variable. The natural logarithm of the firm's total assets is used as measure for bank size (Skopljak & Luo, 2012).

The theory that underpins this study is extreme value theory. Leonard Tippet proposed extreme value theory in 1950 and it models and measures occurrences with extremely low probability. This theory broadens the understanding of operational risk management by indicating that risk securitization and alternative risk transfer emphasize the convergence of finance at the product level. Several researches have employed this theory, including Makokha, Namusonge, and Sakwa (2016) and Kamau and Njeru (2016), whose studies investigated the influence of operational risk on financial performance. Extreme value theory, however, aids in estimating the minimum and maximum capital that could be set aside to cover market risk.

2. Literature Review

Concept of Operational Risk

According to Goodhart (2001), operational risk is the risk associated with carrying out a company's business functions. It is a broad concept that focuses on the risks posed by the people, systems, and processes that a company employs. Other categories include fraud risks, legal risks, and physical or environmental risks. Cristina, Cornelia, and Nicoleta (2008) define operational risk as the risk of direct income loss caused by internal events such as insufficient personal, significant errors, or illegal behavior as a result of errors or inadequate systems and processes, or external events where the risks are not covered by credit, market, or interest rate risk. The most significant risk that organizations face is operational risk. Many financial institutions have spent tens of millions of dollars in an attempt to develop a solid framework for measuring and managing operational risk (Hoffman, 2002). Despite this significant investment, developing a viable operational risk management program remains an elusive goal for many businesses.

Empirical Review

Fadun and Oye (2020) use secondary data extracted from audited financial statements of selected commercial banks in Nigeria to examine the impact of operational risk management practices on the financial performance of commercial banks in Nigeria from 2008 to 2017. The Linear Multiple Regression Model was used to analyze the data, and the results revealed that there is a positive relationship between operational risk management and bank financial performance. Simamora and Oswari (2019) examined the effects of credit risk, operational risk and liquidity risk on the financial performance of banks listed in Indonesian stock exchange using secondary data extracted from the financial reports of five (5) sampled banks out of the 43 licensed banks in Ethiopia from 2009-2017. The independent variables were credit risk (measured by non-performing loan ratio), liquidity risk

(measured by loan to deposit ratio) and operational risk (measured by operational cost to operational income). Financial performance is the dependent variable and was measured by ROA. The data was analysed using the multiple linear regression model and the result showed that operational risk and liquidity risk had significant negative effect on financial performance. Credit risk had non-significant effect on financial performance.

Olalere, Aminul, Yusoff, and Shamsuddin (2018) explored operational risk in Nigeria banking industry for the period of 2009 to 2015, the study employed a panel data approach for the analytical model to run Hausman test for random or fixed effect choice and hypothesis testing. The banks performance was proxied by net interest margin while operational risk is proxy by cost to income and total operating expenses to total assets ratio. Bank size and GDP growth were used as control variables. Based on the random effect analysis in the model, bank efficiency ratio (ER) had a negative significant effect on firm performance, suggesting that, the lower the cost to income ratio, the better the bank performance in terms of Net Interest Margin. Operating expenses ratio has a positive significant effect on firm performance. The bank size is not an important determinant of bank performance in Nigeria, as compared to operational risk while GDP plays an important role in performance of commercial banks during the period of study. Therefore, this study has been taken over by time since the scope of the study is 2009 to 2015.

Muriithi and Waweru (2017) explored the effect of operational risk on financial performance of commercial banks in Kenya. The study used ordered logistic model and findings reveal that there exists an inverse relationship between operational risk and financial performance. The study also finds that bank size moderates the effect of internal and external fraud on financial performance of commercial banks in Kenya by shrinking it. Bank size moderates the effect execution, delivery and process management on financial performance of commercial banks in Kenya by enhancing it. Muriithi and Muigai (2017) analyzed the effect of operational risk on profitability of commercial banks in Kenya for the period of 2005 and 2014 using 43 registered commercial banks in Kenya. Panel data techniques of random effects estimation and generalized method of moments (GMM) were used and the findings indicate that cost income is negatively associated with bank profitability both in long run and in short run. Siminyu, Clive and Musiega (2016) examined the influence of operational risk on the financial performance of deposit on savings and credit cooperatives in Kakamega County, using a descriptive survey design, the study use a sample size of 56 respondents and a semi-structured questionnaire was used to collect the data. The study used descriptive statistics and finding revealed that there was a significant positive linear relationship between financial systems and financial performance of SACCOs in Kakamega County.

Meshack and Mwaura (2016) examined the effect of operational risk management practices on the financial performance in commercial banks in Tanzania using a sample size of 34 commercial banks in Tanzania The study used descriptive research design. Questionnaires were the primary data collection tool in their study. The data gathered from the respondents was analyzed and presented using descriptive statistics and the findings revealed that, the three independent variables

in the study credit risk, Insolvency risk and Operational efficiency influenced the financial performance of banks for the period of study. Muriithi (2016) investigated the effect of market risk, credit risk, liquidity risk and operational risk on financial performance of commercial banks in Kenya using secondary data for the period of 2005 to 2014 which were extracted from the audited annual reports of forty three (43) listed commercial banks in Kenya. However, the study concludes that liquidity risk, market risk, operational risk and credit risk have significant negative impact on the financial performance of commercial banks in Kenyan and operational risk was stressed to have the greatest impact on banks performance.

Ng'aari (2016) examined the effect of risk management practices on profitability of listed commercial banks in Kenya for the periods 2002-2015 using secondary data collected from the audited financial statement of the banks. Panel regression analysis was employed to analyze the data and the result showed that operational risk management, liquidity risk management and credit risk management have significant positive effect on banks' profitability. Epetimehim and Obafemi (2015) examined operational risk management and the financial sector development using a sample of 150 employees from different financial institutions, such as banks, insurance, stockbrokers, microfinance companies etc. Analysis of Variance was used in testing the hypothesis and the result showed that operational risk management has positive effects on the financial development and growth in the financial sector.

3. Methodology

The study used ex-post facto design and a census sample to generate a sufficient number of observations to facilitate data analysis. The study extracts panel data from the financial statements of 13 listed DMBs in Nigeria that have the required data for the period 2014–2020. The study's variables include a dependent variable, financial performance measured by net interest margin. NIM is used as a measure of bank performance because most empirical studies in the area of financial risk focus on ROA and ROE as performance measures. The study however justifies the use of net interest margin as it measures the difference between interest income generated by banks and interest paid out to their lenders in relation to the amount of interest earning assets (Owoputi, Kayode, & Adeyefa, 2014; Dumicic & Ridzak, 2013; Ongore & Kusa, 2013). However, it is calculated by dividing net interest income by the average interest earning assets. The independent variable is operational risk measured by cost income ratio. The cost-to-income ratio is also referred to as the Efficiency Ratio or the Expense-to-Income Ratio. Profits increase if costs are reduced for a given level of income, and vice versa. When profits rise, so does the return on investment, which is very important to bank owners. However, variability in deposit money banks' cost-to-income ratio may be a better measure of volatility in their cost performance. The cost to income ratio is the ratio of the bank's non-interest (operating) cost minus bad and doubtful debt to its net interest income plus non-interest income. The inclusion of the net interest income term in the denominator reduces the volatility that could result from changes in the overall level of interest rates (Correa & Raju, 2008). Bank size (BSIZE) is the

moderating variable and is measured by the natural logarithm of total assets of the banks (Skopljak & Luo, 2012).

However, the study runs a normality test on the dataset to see how it behaves. Relevant diagnostic and robustness tests, such as the Multicollinearity Test, Model Specification Test, Heteroskedasticity Test, and Hausman Specification Test, were performed to determine the best model for analysis and to determine whether or not the estimated models meet the conditions for acceptance. In order to examine the moderating effect of bank size on the relationship between operational risk and the performance of listed DMBs in Nigeria, the following model is specified: The original regression model is specified as follows:

$Y_{it} = \alpha + \alpha_1 \mathbf{X}_{it} + \alpha_2 \mathbf{Z}_{it} + \alpha_3 \mathbf{X}_{it} * \mathbf{Z}_{it} + \mathcal{E}_{it}$ …………………………………………… 1

Where the dependent variable is denoted by Y_{it} of bank i at time t, α is the constant, the coefficients of the independent variable and the moderating variables are denoted by α_1 and α_2 for bank i at time t while α_3 is the coefficient of the interaction effect between X and Z which measures the moderation effect and $\mathcal{E}_{it}$ is the disturbance or error term. Based on the above, the model can be decomposed as follows:

$NIM_{it} = \beta + \beta_1 CIR_{1it} + \beta_2 BSIZE_{2it} + \beta_3 CIR_{it} * BSIZE_{it} + \mathcal{E}_{it}$ ……………………….. 2

Where: NIM = Net Interest Margin measuring performance, CIR = Cost Income Ratio proxy for operational risk, BSIZE = Bank Size which is moderating variable proxy by natural log of total asset, CIR*BSIZE= interaction effect between CIR and BSIZE which measures the moderation effect, and $\mathcal{E}_{it}$ = is the disturbance or error term.

4. Results

Table 1: Summary of Descriptive Statistics

VARIABLE	OBS.	MEAN	STD. DEV.	MIN.	MAX.
NIM	91	6.856923	1.588726	1.025	8.767
CIR	91	2.65478	.1676022	2.246	2.992
BSIZE	91	7.70511	1.629121	2.008	9.599
CIR*BSIZE	91	1.875604	.2365943	1.015	3.044

*Note: NIM= net interest margin, CIR= cost income ratio, BSIZE= bank size, CIR*BSIZE= interaction term between CIR and BSIZE.*

From Table 1 above, the descriptive statistics show mean values of 6.856, 2.654, 7.705 and 1.875 for NIM, CIR, BSIZE and CIR*BSIZE, while 1.025 and 8.767, 2.246 and 2.992, 2.008 and 9.599 and 1.015 and 3.044 are the corresponding minimum and maximum values for the variables. In most of the variables, the values show a wide range of dispersion. Similarly, the standard deviations of the variables differ significantly from the respective means of the data, indicating that the banks' responses to these phenomena vary widely.

Furthermore, the Shapiro Wilk test for data normality indicates that, none of the variables are normally distributed. When using financial data, it is nearly impossible to use normally distributed data because the distribution is

unsystematically distributed between and within banks (Wooldridge, 2013). Non-normality of data, however, has no effect on the validity of estimations with regression based on the Gauss-Markov Theorem (Shao, 2003). The link test was also used to perform the model specification test. The link test is based on the assumption that, if a regression is properly specified, the inclusion of an additional independent variable should not be significant, except by chance. The _hat value, which is the model's predicted value, is significant, as expected for the NIM (0.000) model. Similarly, the _hatsq value for the NIM (0.187) model is insignificant, indicating that the model is correctly specified. A Pearson correlation analysis was also performed on the variables to determine the degree of relationship between the dependent and independent variables. The correlation matrix is shown in Table 1 as follows:

Table 2: Pairwise correlation of component of Operational risk

	NIM	CIR	BSIZE	CIR*BSIZE
NIM	1.0000			
CIR	0.2806*	1.0000		
BSIZE	0.9189*	0.3496*	1.0000	
CIR*BSIZE	0.1607	0.1837	0.4271*	1.0000

*Note: * denotes 5% level of significance. NIM= net interest margin, CIR= cost income ratio, BSIZE= bank size, CIR*BSIZE= interaction term between CIR and BSIZE.*

A high level and strong form of relationship between dependent and individual independent variables is expected in correlation analysis, while a low level and weak form of relationship between and among independent variables is expected. However, according to the correlation matrix shown in Table 2, only CIR and BSIZE had a strong positive correlation with NIM, whereas, the interaction term between CIR and BSIZE had a weak positive correlation with NIM. The findings also revealed that CIR and BSIZE had a significant positive relationship, whereas the correlation between the interaction term CIR*BSIZE is weak but positive. According to the correlational matrix, there is no evidence of multicollinearity, as recommended by Gujatati (2004).

The pooled panel result was subjected to diagnostic tests for multicollinearity and heteroskedasticity. The variance inflation factor revealed a value of 1.24, which is less than 2, indicating that multicollinearity does not exist. To check for heteroskedasticity, the Breusch-Pagan/Cook-Weisberg test was used. The results show a chi2 value of 132.03, which is significant at 1%, indicating that the dataset violates the homoscedasticity assumption. Due to the violation of the homoscedasticity assumption in the pooled panel result as revealed by the Breusch-Pagan/Cook-Weisberg test that turns chi2 value of 132.03 which is significant at 1%, the study re-run a pooled panel regression using robust option as recommended by Gujarati and Porter (2009) to correct the problem of heteroskedasticity.

Both fixed effects (FE) and random effects (RE) tests were run using the Generalized Least Squares (GLS) method. The results revealed a significant difference between FE and RE, allowing the Hausman specification test to be used to determine which model was superior. The Hausman test resulted in a chi2

statistic of 18.70 and a p-value of 0.0003. According to the Hausman result, the FE model is preferable to the RE model to control for time-invariant unobserved characteristics across the DMBs listed. As a result, the fixed effect model was interpreted.

Table 3: Fixed Effect Estimates for moderating effect of Bank Size on Banks Performance

Model A NIM			
	Coef.	T-statistic	P-values
CIR	-.915	-2.48	0.016***
BSIZE	.897	7.94	0.000***
CIR*BSIZE	-2.041	-6.51	0.000***
CONS	6.198	4.85	0.000
R-Squared	Within	0.5382	
	Between	0.9685	
	Overall	0.8998	
Rho		.3775	
F-statistic		29.14***	

*Note: ***, **, * denotes 1%, 5%, and 10% level of significance. NIM= net interest margin, CIR= cost income ratio, BSIZE= bank size, CIR* BSIZE = interaction term between CIR and BSIZE.*

Table 3 shows that, the F-statistics returns values of 29.14 which is statistically significant at 1% level of significance. This confirms the overall significance of the model. It further supports the assumption of a significant linear relationship between the dependent variable NIM, and the independent variable. The interclass correlation (rho) is 37.8% implying that 37.8% of the variation in NIM is due to differences across the banks. The within and between R-squares are 53.8% and 96.9% respectively. Thus, 53.8% of variation in NIM is due to differences within individual listed DMBs while 96.9% of the variation is due to differences between the listed DMBs. The overall R-squares are 89.9% indicating that the variables considered in the models explain about 89.9% change in NIM, while about 10.1% change may be as a result of other variables not captured by the models.

From Table 3 above, the regression results showed that the CIR has negative coefficient of 0.915 with a p-value of 0.016 which is significant at 5% indicating significant negative effect of CIR on performance of listed DMBs in Nigeria. This implies that holding other factors constant, a 1% increase in CIR decreases the profitability of DMBs by 91.5%. This shows sufficient evidence to support the research finding at 1% level of significance. The finding is consistent with studies by by Muriithii (2016), Muriithi and Waweru (2017), Muriithi and Muigai (2017), Olalere, Aminul, Yusoff, and Shamsuddin (2018) whose study found a significant negative effect of CIR on banks profitability while it is inconsistent with studies of Epetimehim and Obafemi (2015), and Siminyu, Clive and Musiega (2016) who found a significant positive effect of CIR on banks profitability. From table 3, the result shows that Bank size has positive coefficient of 0.897 with a p-value of 0.000 which is significant at 1% level indicating that BSIZE had significant positive

effect on performance of listed DMBs in Nigeria. This implies that, holding other factors constant, a 1% increase in BSIZE increases the profitability of DMBs by 89.7%. Therefore, bank size has significant positive effect on performance of listed DMBs measured by NIM. However, the findings is in accordance with the theory and prior expectation that argued that, larger banks may incur lower cost for efficient information gathering, processing and analysing due to economies of scale. Therefore, larger banks were better placed than smaller banks in the country by harnessing economies of scale in transactions over the sampled period.

Also, the result from Table 3 shows that, the moderating effect of bank size on the relationship between operational risk and performance of listed DMBs in Nigeria had a negative coefficient of 2.041 with a p-value of 0.000 which is significant at 1% level indicating that, the interaction term between CIR and BSIZE has significant negative effect on performance of listed DMBs in Nigeria. However, the null hypothesis that there is no moderating effect of bank size on the relationship between operational risk and performance of listed DMBs in Nigeria was rejected at 1% level of significance.

5. Conclusion and Recommendations

Base on the empirical findings, the study concludes that, cost income ratio had significant negative effect on profitability of listed DMBs in Nigeria measured by NIM at 1% level of significance while bank size moderate the relationship between CIR and performance of listed DMBs in Nigeria. The effect is significant and negative. However, negative effect of operational risk on banks performance may be as a result of regulators inability to regularly review listed DMBs' vulnerability to operational risk and ineffective integration of operational risk management policy in their overall risk management framework. However, the study recommends that DMBs should on a quarterly basis estimate the likelihood of an operational loss event occurring and its potential impact on bank financial performance, as well as, put in place effective internal reporting practices and systems that are consistent with the scope of operational risk defined by supervisors and the banking industry as a whole.

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