International Journal of Multidisciplinary and Current Educational Research (IJMCER)
ISSN: 2581-7027 ||Volume|| 5 ||Issue|| 2 ||Pages 125-137 ||2023||

The Impact of Cost-to-Income Ratio on Bank Performance in Nigeria

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ABSTRACT: The study focused on the cost-to-income ratio (CIR) as a measure of efficiency and its impact on bank performance of tier 1 and tier 2 banks in Nigeria. The results revealed that the impact of CIR on return on assets (ROA) is negative and significant, reflecting the detrimental effect of high CIR on bank performance. With capital adequacy and bank size, the impact of CIR on ROA became positive, although insignificant. However, in terms of size effect, the tier 2 banks showed more negative impact than the tier 1 banks. Thus, with a high cost-to-income ratio, the performance of the tier 1 banks is better than the tier 2 banks, implying that the tier 1 banks are more cost-efficient.

KEYWORD: Cost-to-income Ratio; Bank Performance; Bank Size; Capital Adequacy

I. THE IMPACT OF COST-TO-INCOME RATIO ON BANK PERFORMANCE IN NIGERIA

Understanding the concept of efficiency is crucial to measuring bank performance and peer comparison. The concept of efficiency denotes different meanings to disciplines, but in a more specific term, efficiency is the ratio of output to input. Efficiency deals with the best performance of using the least resources devoid of waste to actualize the highest possible outcomes. According to Alber et al. (2019), efficiency refers to using minimal inputs to produce the best output; it is about making the best use of resources to produce the best products at the lowest cost. Pradhan and Parajuli (2017) define operational efficiency as a firm's ability to deliver goods and services in a cost-effective manner without compromising quality. As a comparative concept, efficiency involves effectively converting inputs into outputs relative to best practices. Kinnon (1973) argued that the efficiency of economic institutions is crucial in deciding the rate of capital formation, financial investments, technical advancements, and hence the development of the national economy. Thus, efficiency is an indicator that demonstrates a firm's ability to maintain the rate of revenue growth above the rate of operating cost increase (Elahi & Poswal, 2017).

How well a firm utilizes its resources greatly influences the degree of its productive and financial performance. As a result, the subject of efficiency is crucial because the banking sector's role in determining an economy's growth and development is paramount (Nitoia & Spulbar, 2015). As a result, bank efficiency is an important area on which financial regulators and analysts, bank customers, and investors have been focusing for several decades to measure bank performance. Banks' efficiency depends on their ability to maintain low production costs while leaving ample capital to assure optimum returns on output from a profitable endeavor (Fagge et al., 2012). Hence, efficiency allows a bank to gain a competitive advantage by providing a variety of services to its customers at a reasonable cost, thereby creating a reward for shareholders (Hussain, 2014).

Improving banking institutions' operating efficiency and productivity are critical to creating value and competitive advantage. According to Alam and Nazmoon (2019), the operational efficiency of banks is vital to the survival and stability of the financial system. Banking efficiency is paramount because it has implications for the stability of financial systems and, ultimately, the economy (Banya & Biekpe, 2018). Accordingly, studies have shown that efficient banks outperform their inefficient competitors in terms of cost and competitiveness Fagge et al. (2012),. Through banking integration, mergers and acquisitions, and technological advancement, efficiency has recently been a vital competitive tool for banks. As a result, bank managers have increasingly emphasized minimizing operating expenses and offering more efficient products and services. Therefore, more efficient banking operations would improve the financial stability, spur new product development, and increase

consumers' and enterprises' access to finance (Fagge et al., 2013). Over time, a variety of financial indicators derived from the financial statements have been used to measures banks' performance and operating efficiency (Bhunia et al., 2011; Russel, 2019). Bhunia et al. (2011) further argued that the ultimate goal of profitability, which forms the basis of performance evaluation, can be achieved by efficiently using the available resources. Since we cannot directly assess efficiency and competition, a variety of indirect measures in the form of simple indicators have been developed and employed in both theory and practice (Bikker, 2010). One of the crucial metrics for evaluating the success of a bank is the cost-to-income ratio. Return on assets (ROA) and return on equity (ROE) are additional indicators of bank performance. According to several research, the ROA serves as a common benchmark for evaluating a bank's performance and a sign of how efficiently it operates (Petersen & Schoeman, 2008; Fitsum & Asmerom, 2016), while the CIR is a commonly used measurement of banks' performance (Knight, 2003). Accordingly, the CIR has demonstrated more acceptability among the efficiency ratios because of its clarity and ease of use.

Statement of Research Problems and Objectives: The recurring global financial crisis in the last two decades, further acerbated by the COVID-19 pandemic, has heightened concerns about the operational performance of Nigerian banks and their direct impacts on the stakeholders. Governments and regulators in different parts of the world have implemented palliative measures to revitalize their economies after the impacts of COVID-19 (Cepoi, 2020). As a result, banks have been witnessing a depletion in interest income and other income lines. Following the economic downturn resulting in lower profit margins, the banks have continued to push for cost containment and operational efficiency to achieve their recovery plans and growth strategy. In the aftermath of the global pandemic and the resulting difficult macroeconomic conditions, the task facing banks is not only to reduce costs but also to promote efficiency through resource optimization.

Moreover, Nigerian banks operate under unstable macroeconomic fundamentals and, if poorly managed, can result in poor performance. However, analysts and investors use banks' performances to assess their competitive advantage on different parameters and a bank's capacity to withstand unforeseen operational losses during an economic meltdown. Therefore, in this context, it is necessary to explore the basis for evaluating Nigerian banks' operating efficiency. The CIR, as a measure of bank performance, gives an overview of how efficient the operation of a bank is. A widespread perception in the banking sector is that high CIR equals low productivity and competitiveness since expenses will rise relative to income (Kumar & Srivastava, 2021). A lower CIR equates to optimal productivity and effectiveness, implying that banks can achieve the highest profitability level with minimal costs. Investors can see how efficiently the bank manages its business from the CIR; the lower the CIR, the more profitable it will be. On the other hand, increases in the CIR may also highlight potential problems, especially if it is persistent over a long period. Hence, the CIR represents a vital measure of success in bank operations. Hence, using ROA as a proxy for bank performance, this study examines the effect of CIR on bank performance in Nigeria.

In addition, according to Bichsel and Blum (2005), the 2004 Basel framework endorsed new capital adequacy to achieve worldwide synchronization of banking regulation that would improve banks' performance. Implementing the framework boosted the required capital base of banks but also the number of banks decreased from 89 to 25. The Basel framework has revealed that the capital level affects a bank's performance and insolvency. According to Welch (2006) and Berger (1995), capital adequacy and CIR are among the leading measures of analyzing a bank's efficiency. Consequently, some studies have found capital adequacy to be one of the driving factors of a bank's efficiency. So, this study also investigated the impact of capital adequacy on Nigerian banks' performance.The *"size effect"* phenomenon has existed for a while and has remained an important factor in assessing a firm's performance. Firm size has been a crucial and essential characteristic in empirical studies of corporate finance and has continued to be one that researchers are primarily interested in (Dang et al., 2018; Hashmi et al., 2020). Due to the ability to maximize the advantages of economies of scale, a firm's size will impact how efficiently it operates. According to Tharu and Shrestha (2019), large firms can produce more affordably than small ones because they can distribute fixed costs across a larger output volume. However, this will only happen if the firm efficiently utilizes available resources to generate maximum output; otherwise, large size may militate against productivity and profitability.

The size of the banks has significantly impacted their performance since larger banks can offer more competitive goods and services at lower costs. However, if a bank cannot efficiently utilize its assets to increase revenues, size may be a disadvantage. A large asset base without operational efficiency may not lead to improved profitability; hence the "*size effect"* is relative. Dang et al. (2018) asserted that despite the significance of size in empirical corporate finance, no literature has yet to explain the usage of a specific measure of firm

size. We proxied bank size with the log of total assets because the goal of this study is to examine how effectively a bank leverages its assets to lower its CIR.

Given the above discourse, this study examines how the cost-to-income ratio impacts bank performance in Nigeria. In addition, the study aims to achieve the following specific objectives:

1. Determine the relationship between the cost-to-income ratio and bank performance in Nigeria.
2. Examine whether bank size and capital adequacy can moderate the effect of the cost-to-income ratio on bank performance in Nigeria.
3. Analyse the impact of CIR of tier 1 and tier 2 banks in Nigeria on bank performance.

II. LITERATURE REVIEW

Bank performance and Cost-to-income ratio : There are several academic studies on the real-world uses of the CIR, often known as the efficiency ratio, in financial institutions. According to Hussain (2014), CIR is one of the critical indicators that professionals examine when discussing bank productivity and efficiency. Although Welch (2006) has recognized specific weaknesses in CIR, it is still an increasingly important measure to examine bank efficiency and profitability The CIR, according to Welch (2006), is the ratio of a bank's costs to its earnings, and hence financial experts frequently hold that poor (high) productivity and efficiency correlate with high (low) CIR.

The study on the assessment of Ukrainian bank effectiveness by Magdalena et al. (2020) found that the CIR negatively influences the ROA as a proxy for bank performance. This result aligns with previous studies by Hess and Francis (2004), who linked banks' net earnings to negative CIR, and Syafri et al. (2012), which discovered a negative relation between the CIR and profitability of Indonesian banks. Moreover, Almazari (2013) found that the relationship between Saudi Arabian banks' CIR and ROA is negative. Similarly, Ahmad (2013) used a regression analysis model to investigate the efficiency of Saudi Arabian banks from 2007 to 2011. The finding, in line with Almazari (2013), showed that CIR impedes bank profitability of Saudi banks. Furthermore, Ghosh et al. (2003) found an inverse relationship between CIR and bank efficiency, indicating that a higher CIR leads to a lower bank efficiency. The results imply that poor management of resources is a significant contributor to poor earnings (Sufian & Chong, 2008).

Using Nepalese commercial banks as a case study, Pradhan and Parajuli (2017) showed that CIR has a negative relationship with ROA. Chalise (2019) extended this study into a longer period but using only ROA, and the results still showed the same negative impact of CIR on ROA. Mathuva (2009) also revealed that the ROA of Kenyan commercial banks negatively influences the CIR. Likewise, Antwi (2019), using ROA as a measure of bank performance, revealed further that the CIR of Ghanaian banks' has a negative influence on performance. In addition, Obamuyi (2013) found that effective operating cost management is among the factors that significantly influence bank performance. Furthermore, in Nigeria, there is some evidence of an insignificant relationship between the CIR and bank performance. In the study of the predictors of bank profitability, Aremu et al. (2013) found that operating efficiency (CIR) does not significantly predict the banks' profitability. However, the reliability of the outcome is questionable; it should not be generalized to the whole bank in the country because the sample size was one bank. Similarly, Soyemi et al. (2013) employed a linear ordinary regression model to examine the factors predicting banks' profitability in Nigeria. The results revealed that CIR had a positive but insignificant impact on bank profitability. Given the preceding reviews of bank performance and CIR, it is possible to argue that ineffective cost management contributes to different bank failures worldwide. To further advance this conversation, this study explores how CIR affects bank performance in Nigeria, leading to the first hypothesis formulated below.

Hypothesis 1: Cost-to-income ratio negatively and significantly affects bank performance in Nigeria.

Bank performance, capital adequacy, and bank size

By serving as a mediator between the economy's surplus and deficit sectors, banks are crucial for promoting economic growth. According to Abbas et al. (2019), globalization and global economic integration have made banks' crucial functions as the engine of the economy even more burdensome. Additionally, Hariemufti (2019) argued that all areas of the economy require banking services and financial support for their transactions. As a result, if banks' capital structures are not properly controlled, banks with inadequate capital or bad capital management may fail. The capital adequacy framework closely regulates the capital structures of banks. The likelihood of bank failures and the loss of depositors' money decreases when banks have access to sufficient

capital. Moreover, adequate capital addresses the risk issues and moral hazards and accommodates the bank's planned growth (Pradhan & Parajuli, 2017).Capital adequacy is another critical yardstick for measuring a bank's soundness in terms of efficiency and performance (Mpuga, 2002). Mpuga (2002) found that banks can improve their efficiency and performance with an enhanced capital adequacy ratio and increased loss absorption capacity without the banks going bankrupt. Likewise, Fiordelisi et al. (2010) studied the efficiency of European banking and found that capital sufficiency has a favourable impact on European banks' performance. Antwi (2019) argued that while banks insure against losses from their regular profits, some unforeseen losses that regular profits cannot cover may still occur. In such circumstances, the bank's capital serves as insurance against losses. Therefore, having enough capital in the banking industry fosters confidence and assures depositors, investors, and regulators that the bank will continue to be financially sustainable. As a result, it follows that having enough capital should boost the bank's profitability by lowering operational costs.

A study by Neceur (2003) relates that the impact of capital adequacy on Tunisian banks' performance is positive. When Sufian and Chong (2008) looked at the impact of banks' capital adequacy levels on their profitability, they reported the same result in Philippine banks. Using commercial banks in Indonesia as a case study, Syafri et al. (2012) found that capitalization positively impacts banks' performance. Some other studies that support the significant positive influence of capital adequacy on banks' performance are the studies of Alam and Nazmoon (2019) in Bangladesh, Abreu and Mendes (2001) in European economies, Mathuva (2009) in Kenya, Naceur and Kandil (2009) in Egypt, and Irawati et al. (2019) in Indonesia. On the contrary, some studies relate the negative association of capital adequacy to bank performance. Antwi (2019), found that capital adequacy has negative impacts on ROA as measured by Ghanaian banks' performance. Likewise, Pradhan and Parajuli (2017), found that capital adequacy ratio and banks' performance as measured by ROA is negatively related.

Furthermore, Goddard et al. (2004) asserted that due to the high capital-to-asset ratio, banks operate too cautiously and offshoot potential trade opportunities that could be profitable to them, thus implying an inverse relationship between the capital-to-asset ratio and the performance of banks. In the same vein, Pasiouras and Kosmidou (2007) stated that banks could perform better than their peers if they require less external funding due to a higher capital-to-asset ratio. Navapan and Tripe (2003) also found a negative relationship between capital and banks' profitability. The study argued that such a link is self-evident and does not need to be scientifically validated. In Nigeria, Onaolapo (2012) revealed that capital adequacy negatively impacts bank profitability. In essence, the examination of the capital adequacy-bank performance nexus is mixed.

Ben Naceur and Goaied (2008) argued that the size of banks may reflect the existence of economies or dis-economies of scale could be accounted for by bank size. Riding on economies of scale, the bigger the bank, the more efficient it is at allocating its limited resources to produce the most output. As such, the more productive and profitable it will be. Hence, an increase (decrease) in bank size can lead to a rise (fall) in the profitability of a bank. Eyigege (2018) discovered that firm size has a negative and insignificant impact on financial performance, which suggests diseconomies of scale. Similarly, Olawale et al. (2017) looked into how firm size impacts performance in Nigeria. The study revealed that firm size, negatively impacts performance.

In contrast, Akinyomi and Olagunju (2013) explored the impact of firm size on the profitability of Nigeria's manufacturing industry. They found that firm size has a positive effect on profitability. According to the studies by Mehrjardi (2012) and Dogan (2013), a positive relationship between bank size and profitability exists. Ngumo *et al.* (2017) examined the determinants of the corporate financial performance of microfinance banks in Kenya and found a statistically significant relationship between firm size and financial performance. Furthermore, Maina et al. (2019) examined the relationship between firm size and the profitability of commercial banks in Kenya. The result indicates a moderately strong positive correlation between firm size and profitability. Meanwhile, Abubakar (2021) looked at how firm size affected bank profitability in Nigeria. The study established that firm size has an insignificant positive effect on banks' profitability. The result implies that firm size does not significantly impact profitability. Similarly, Sudrajat and Daud (2020) affirmed that firm size does not affect a firm's financial performance proxied by return on assets. In contrast, Hossain and Saif (2019) investigated the effects of firm size and firm characteristics, such as age and independent directors, on banking firms' profitability on the Dhaka Stock Exchange. They found that firm size positively affects firms' profitability.

Moreover, given that CIR, capital adequacy, and bank size affect bank performance, this study contributes to the existing knowledge in this field by investigating the moderating role of capital adequacy and bank performance

on Nigerian banks' performance. The study also looked at how CIR affects the performance of banks classified as Tier 1 or Tier 2 in Nigeria. Studies focusing on the moderating effect of bank size and capital adequacy in measuring bank performance and estimating the impact of CIR on the bank performance of tier 1 and tier 2 banks in Nigeria are scanty. Hence, this study fills such gaps in Nigeria, leading to the second and third hypotheses:

Hypothesis 2: Capital adequacy and size do not moderate the impact of the cost-to-income ratio on bank performance in Nigeria.
Hypothesis 3: The effect of tier 1 and tier 2 banks' CIR significantly predicts their performance.

III. DATA AND METHODS

Variable and Source : This study examines the impact of the cost-to-income ratio (CIR) on the performances of 12 Nigerian banks while accounting for the roles of capital adequacy and bank size. The study covered the period of 2010 – 2021 and collected data from the Factbook of the Nigerian Stock Exchange and the banks' annual report. The variables used are given in table 1, while their summary definition follows suit.

Table 1

Variables and their source

Variables	**Formula**	**Source**
Dependent variable		
Return on asset (ROA)	Net income (after tax)/total assets	Nigerian Stock Exchange
Independent variable		
Cost-income-ratio (CIR)	Operating expense/Operating income	Nigerian Stock Exchange
Control variables		
Capital adequacy (CAD)	Total equity/total asset	Nigerian Stock Exchange
Bank size (BS)	Natural logarithm of total asset	Nigerian Stock Exchange

Variables definition
Return on assets (ROA): Based on some previous studies (Mathuva, 2009; Turkson, 2011; Antwi, 2019), return on asset (ROA) and return on equity (ROE) were typically used to measure bank performance. However, from the regulator's perspective, ROA is the best measure of bank performance (Rivard & Thomas, 1997). In this study, ROA was used to proxy banks' performance. ROA, the yield on total assets invested in a firm's operation, is the ratio of the firm's net income to total assets, expressed as a percentage.

Cost-to-income ratio (CIR): The key financial measure for evaluating the value of banks' performance is the CIR, which depicts a firm's expenditure in relation to its income. It can be measured by finding the ratio of a firm's operational cost (such as the administrative costs, staff salaries, and property costs, excluding losses due to bad and non-performing loans) to operating income, expressed as a percentage.

***Capital adequacy (CAD*)**: CAD measures a bank's capital in relation to risk-weighted credit exposures. If a bank is well-capitalized, it could get more strength to survive during financial crises (Deger & Adem, 2011) while also absorbing unexpected losses (Javaid et al., 2011). According to Molyneux and Thorton (1992), CAD would exert a positive (negative) influence on a bank's performance if there exists a higher (lower) level of equity. This study employed the qualifying capital to total risk-weighted assets (RWA) ratio that the CBN uses to determine the capital adequacy ratio of Nigerian banks.

Bank size (BS): The total asset measures the firm's size (Handayani et al., 2019; Yuliza, 2018). In this study, we measure bank size as a natural logarithm of total assets and use it to analyze the performance of the banking

system. It captures the potential economies or diseconomies of scale in the banking sector. Moreover, based on the size of financial firms, it controls for cost differences in product and risk diversification.

IV. METHODS AND PROCEDURES OF ESTIMATION

Before developing the model, we assess the variables using summary statistics (mean, standard deviation, minimum, and maximum) to describe the variables at level and natural logarithm and correlation matrix to pre-investigate the relationship between the ROA and its predictors. Based on the set objectives, we developed the following equations.

First, the general model of ROA as a function of the predictors is:

$$\mathrm{ROA} = \mathrm{f}(\mathrm{CIR}, \mathrm{CAD}, \mathrm{BS}, \mathrm{CIR} * \mathrm{CAD}, \ \mathrm{CIR} * \mathrm{BS}) \quad [1]$$

$$\mathrm{LROA}_{i,t} = \alpha_o + \alpha_1 \mathrm{LCIR}_{i,t} + \mathrm{e}_{i,t} \quad [2]$$

$$\mathrm{LROA}_{i,t} = \alpha_o + \alpha_1 \mathrm{LCIR}_{i,t} + \alpha_3 \mathrm{LCAD}_{i,t} + \alpha_4 \mathrm{LTOA}_{i,t} + \alpha_5 \mathrm{LCIR} * \mathrm{CAD}_{i,t} + \alpha_6 \mathrm{LCIR} * \mathrm{BS}_{i,t} + \mathrm{e}_{i,t} \quad [3]$$

Where i represents banks and t represents the period. LROA, LCIR, LCAD, and LTOA represents the log of return on asset, cost-to-income ratio, capital adequacy, and total assets, which is bank size (BS). α_o represents the intercept of the model, $\alpha_1 - \alpha_6$ represents the coefficient of assigned predictors, and $e_{i,t}$ is the residual term.

The study employed a panel data technique in estimating the influence of CIR on ROA while accounting for the roles of CAD and BS. The rationale behind using panel model techniques was because the acquired is based on time series (for the period of 2010 – 2021) and cross-sections of 12 banks. Also, since both the period (T) and cross-section (N) are less than 25, ideal panel models, in this case, pooled OLS, fixed effect (FE) model, random effect (RE) model, and one-step system GMM was used to robustness check of the result. We employed these models to ascertain the robustness and consistency of the impact of predictor variables on the ROA.

The pooled OLS, known as pooled regression technique, estimates the intercept and the coefficient of the predictors without the individual entities or time effects. Here the entities are the banks, while the time effects are the study period. So, the pooled OLS mainly investigates the impact of the CIR, CAD, and BS on the ROA. The FE model technique examines the entities' (banks) differences in the intercept but does not consider the error component across the entities, whereas the RE model technique examines how time influences the variation across the entity (error component). However, none of the models above allows for heterogeneities across the panel. Hence, this brings the need to employ the system generalized method of moment technique (sys-GMM), developed by Arellano-Bond (1991). The sys-GMM control for serial correlation, endogeneity problem, serial correlation, and heteroscedasticity. These were assessed by the AR(2) as the post-diagnostic measures. Throughout the model, the p-value of AR(2) is greater than a 5% level of significance, thus indicating no evidence of second-order serial correlation in the model. Hence, we can use the obtained result from the sys-GMM to make an inference..

Summary statistics : Following the laid-down empirical procedures, table 2 shows the descriptive statistics of the target variables at the level and the natural logarithms. The variables at the level revealed that the mean return on asset (ROA) of the 12 banks in Nigeria is 1.670%, with a volatility ratio of 2.465%, which is less than the mean. The result suggests a high dispersion among Nigerian banks' performance, with a minimum performance of -13.628% and a maximum performance of 7.004%. On average, the mean cost-to-income (CIR) ratio of Nigerian banks is 67.506% with a deviation of 19.506%, minimum of 36.11%, and maximum of 204.315%. The mean of the CIR ratio is very high relative to the mean of bank performances (ROA), thus suggesting that CIR could be the major reason for low efficiency among Nigerian banks. More so, capital adequacy (CAD), on average, has a mean of 16.480% that ranges from -201.59% to 16.084% with high dispersion of 24.02% relative to the mean. The bank size (log of total assets) has an average of 14.17% with a standard deviation of 0.968%, which ranges from 11.813% to 16.084%. Regarding the variables at the natural logarithms, we observed that the mean, standard deviation, and range have been reduced, making the deviation and mean closer to each other. This transformation does nothing more than remove potential heterogeneity and residual problems from the estimation, thus making the variables more linear and the output more reliable.

Table 2
Descriptive statistics of the target variables

	At level				
Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	144	1.669638	2.464566	-13.6281	7.0035
CIR	144	67.50602	19.17007	36.11	204.3147
CAD	144	16.46667	24.02483	-201.59	44
BS	144	14.16794	0.9677	11.8127	16.0836
	At Natural logarithms				
Variable	Obs	Mean	Std. Dev.	Min	Max
LROA	135	0.50619	0.695928	-1.35557	1.94641
LCIR	144	4.179321	0.251325	3.58657	5.319662
LCAD	138	2.967415	0.303942	1.8453	3.78419

Correlation Matrix : Table 3 shows the correlation coefficient of the relationship between the dependent variables (ROA) and the predictors. It reveals that the degree of the relationship between ROA and CIR is negative and significant r = -.689, p<.05 indicating that as the cost-to-income ratio of banks increases, there would be a decrease in the banks' performance. Also, ROA positively and significantly relates to capital adequacy and bank size with a correlation coefficient of r=.379 p<.05 and r=.265 p<.05, respectively, thus indicating that banks' performance directly relates to capital adequacy and bank size. Hence, the higher the capital level, the higher the banks' performance (Berger, 1995). Moreover, none of the relationships between the predictors exceed 0.85, which is proof that multicollinearity does not exist in the model, hence satisfying other assumptions of the linear model.

Table 3
Correlation matrix of the target variables

	LROA	LCIR	LCAD	LBS
LROA	1.0000			
LCIR	-0.6891*	1.0000		
	0.0000			
LCAD	0.3792*	-0.3463*	1.0000	
	0.0000	0.0000		
LBS	0.2650*	-0.4781*	0.0121	1.0000
	0.0019	0.0000	0.8883	

* significant at 5%

Cost-To-Income Ratio and Banks Performance : Table 4 presents the regression estimate of the influence of CIR on ROA for the banks under study. The estimates spanned through four columns which are the different panel techniques of estimations. Across the four columns, the results showed that the relationship between CIR and ROA is negative and significant at a 1% level of significance. The pooled-OLS model (column 1) showed that a 1% increase in the CIR would diminish the ROA by 2.410%. The FE model (column 2) and the RE model (column 3) showed that a 1% increase in the CIR would decrease the ROA by 1.112% and 1.798%, respectively. Although the significant value of the Hausman test, p <0.01, suggests that the FE is the preferred model for the CIR-ROA relationship. After controlling for heterogeneity of error variances and serial correlation, the one-step system GMM (column 4) also showed that a 1% increase in CIR would lead to a 0.962% decrease in the ROA. This outcome is in line with the previous studies, which also find that a high cost-in-income ratio is detrimental to the bank's performance (Mathuva, 2009).

Table 4
The regression model of the relationship between the CIR and ROA

VARIABLES	(1) pooled-OLS	(2) FE	(3) RE	(4) one-step sys-GMM
LCIR	-2.410***	-1.112***	-1.798***	-0.952***
	(0.175)	(0.249)	(0.307)	(0.286)
L.LROA				0.685***
				(0.116)
L2.LROA				-0.113
				(0.103)
Constant	10.77***	5.281***	8.176***	4.140***
	(0.760)	(1.000)	(1.272)	(1.175)
Year dummy	Yes	Yes	Yes	Yes
Observations	135	135	135	104
R-squared	0.578	0.227		
Hausman test(p)	0.000			
Arellano-Bond(2)	0.659			
Sargan test(p)	0.002			
Hansen test(p)	1.000			
Number of company1	12	12	12	12

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Cost-to-income ratio and banks performance while controlling for capital adequacy and bank size

Table 5 presents the regression estimate of the influence of the cost-to-income ratio on return on assets while controlling for the moderating role of bank size and capital adequacy. The estimates spanned through four columns which are the different panel techniques of estimations. The first three columns showed that none of the predictors of the return on assets is significant. However, after controlling for the possible problem of endogeneity and serial correlation, the system GMM result (column 4) showed that the relationship between the cost-to-income ratio and return on assets is not significant. In contrast, the control variables, capital adequacy and bank size, negatively and positively influence the return on assets. The result implies that the combination of capital adequacy and bank size has nullified the negative significance of the cost-in-income ratio on bank performance. In other words, high capital adequacy and an improved bank size have the potential to lessen the adverse effect of the cost-to-income ratio on the performance of banks in Nigeria. Notably, a 1% increase in capital adequacy will decrease the return on assets by 4.636%. This result is in tandem with previous studies (Navapan & Tripe, 2003; Mathuva, 2009; Onaolapo, 2012; Pradhan & Parajuli, 2017; Antwi, 2019) who empirically asserted that capital adequacy and banks performance are inversely related. According to Mathuva (2009), such negative influence accounts for why banks with more equity have higher retained earnings (dividends), which leads to the inability to retain funds that the bank can use to boost their profits. Also, a 1% increase in bank size increases the return on assets by 2.232%, indicating that banks with larger sizes are more efficient (profitable) than banks with smaller sizes. Thus, the growth in the banks' assets can foster their profitability since the assets, if efficiently managed, could be used to generate more profits for the banks (Mathuva, 2009). Furthermore, the interaction effects of the cost-to-income ratio and capital adequacy/bank size significantly influence the return on assets.

Table 5
The regression model of the relationship between the CIR and ROA

VARIABLES	(1) pooled-OLS	(2) FE	(3) RE	(4) one-step sysGMM
LCIR	4.142	-1.038	3.143	3.619
	(3.610)	(4.637)	(4.228)	(2.417)
LCAD	-0.566	-2.795	-0.829	-4.636**
	(4.215)	(3.465)	(4.878)	(2.052)
BS	2.025	0.449	1.741	2.232***
	(1.396)	(1.608)	(1.598)	(0.586)

LCIR x CAD	0.179	0.664	0.229	1.154**
	(0.987)	(0.792)	(1.135)	(0.509)
LCIR x BS	-0.495	-0.124	-0.418	-0.551***
	(0.330)	(0.358)	(0.378)	(0.138)
L.LROA				0.678***
				(0.138)
L2.LROA				-0.0718
				(0.121)
Constant	-16.63	5.945	-12.82	-14.62
	(15.52)	(21.00)	(18.64)	(10.27)
Observations	132	132	132	103
R-squared	0.579	0.178		
Hausman test(p)		0.1494		
Arellano-Bond(2, p)				0.790
Sargan test(p)				0.002
Hansen test(p)				1.000
Number of company1		12	12	12

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Tier 1: Cost-to-income ratio and banks performance : Table 6 presents the regression estimate of the influence of CIR on ROA for the tier 1 banks. The estimates spanned through four columns which are the different panel techniques of estimations. Across the four columns (except column 2), the results showed that the relationship between CIR and ROA is negative and significant at a 1% level of significance. In essence, the pooled-OLS model (column 1) showed that a 1% increase in the CIR would diminish the ROA by 2.535%. According to the RE model (column 3), which is preferable between FE and RE based on the Hausman test (p > .05), a 1% increase in the CIR would decrease the ROA by 1.293%. After controlling for heterogeneity of error variances and serial correlation, the one-step system GMM (column 4) also showed that a 1% increase in CIR would lead to a 0.702% decrease in the return on asset.

Table 6

The regression model of the relationship between the CIR and ROA for Tier 2 banks

	(1)	(2)	(3)	(4)
VARIABLES	pooled-OLS	FE	RE	one-step sysGMM
Lcir	-2.535***	-0.388	-1.293*	-0.702***
L.Lroa				0.931***
				(0.0820)
L2.Lroa				-0.201*
				(0.0891)
Constant	10.88***	2.057	5.773**	3.115***
	(0.973)	(3.314)	(2.747)	(0.549)
Observations	59	59	59	48
R-squared	0.536	0.236		
Hausman test(p)		0.9709		
Arellano-Bond(2, p)				0.327
Sargan test(p)				0.107
Hansen test(p)				1.000
Number of company1		5	5	5

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Tier 2: Cost-to-income ratio and banks performance.

Table 7 presents the regression estimate of the influence of CIR on ROA for the tier 2 banks. The estimates spanned through four columns which are the different panel techniques of estimations. Across the four columns

(except column 4), the results showed that the relationship between CIR and ROA is negative and significant at a 1% level of significance. The pooled-OLS model (column 1) showed that a 1% increase in the CIR would diminish the ROA by 2.227%. The FE model (column 2) and the RE model (column 3) showed that a 1% increase in the CIR would decrease the ROA by 1.225% and 2.227%, respectively. Although the value of the Hausman test, p >.05, suggested that the RE is the preferred model for the CIR-ROA relationship. After controlling for heterogeneity of error variances and serial correlation, the one-step system GMM (column 4) also showed that a 1% increase in CIR would lead to a 0.746% decrease in the return-on-asset, but the relationship is not significant.

Table 7

The regression model of the relationship between the CIR and ROA for Tier 2 banks

	(1)	(2)	(3)	(4)
VARIABLES	pooled-OLS	FE	RE	one-step sysGMM
Lcir	-2.227***	-1.225***	-2.227***	-0.746
	(0.431)	(0.184)	(0.661)	(0.567)
L.Lroa				0.614***
				(0.127)
L2.Lroa				-0.0563
				(0.132)
Constant	10.32***	5.993***	10.32***	3.220
	(1.887)	(0.678)	(2.894)	(2.416)
Observations	76	76	76	56
R-squared	0.537	0.426		
Hausman test(p)		0.2247		
Arellano-Bond(2, p)				0.353
Sargan test(p)				0.071
Hansen test(p)				1.000
Number of company1		7	7	7

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

V. CONCLUSION AND RECOMMENDATIONS

The recurring global financial crisis in the last two decades, further acerbated by the COVID-19 pandemic, has heightened concerns about the operational efficiency of Nigerian banks and their direct impact on the stakeholders. However, analysts and investors use banks' performance to assess their competitive advantage on different parameters and their capacity to withstand unforeseen operational losses during an economic meltdown. In this context, this study examines the impact of the cost-to-income ratio on bank performance in Nigeria. Therefore, in this context, this study explores the basis for evaluating Nigerian banks' operational efficiency using the cost-to-income ratio. This study investigated the impact of the cost-to-income ratio on Nigerian banks' performance (proxied by return on assets) while considering capital adequacy and bank size as control variables. Based on the proposed model, this study compared the effect of CIR on tier 1 and tier 2 banks' performance in terms of size and significance effect. For more robustness checks of the estimation, four different techniques of panel estimation – pooled OLS, fixed effect model, random effect model, and system-generalized method of moments – were employed.

The findings revealed that the impact of the cost-to-income ratio, while controlling for the capital adequacy and the bank size on return on assets, is negative and significant across all the estimation techniques, thus indicating that a higher cost-to-income ratio is detrimental to the performance of Nigerian banks. The result is in line with several other studies (Mathuva, 2009; Syfari et al., 2012; Antwi, 2019; Chalise, 2019; Magdalena et al., 2020)). However, the inclusion of capital adequacy and bank size in the model moderated the negative influence of the CIR on return on assets; the result became positive and insignificant. Again, this particular result is in tandem with the study of Aremu et al. (2013), who found that the CIR has an insignificant impact on banks' performance in Nigeria. Similarly, Soyemi et al. (2013), amidst capital adequacy and bank size, discovered that the impact of the CIR on the performance of Nigerian banks is positive but insignificant.

Moreover, in line with the study of Navapan and Tripe (2003), Mathuva (2009), Onaolapo (2012), and Antwi (2019), capital adequacy has a negative and significant impact on bank performance. The adverse effect could result from an increased capital asset ratio, making the banks operate cautiously and miss potentially profitable trading opportunities (Goddard et al., 2004). The result contradicts studies that found capital adequacy to positively and significantly impact on bank's profitability (Neceur, 2003; Sufian & Chong, 2008; Naceur & Kandil, 2009; Syafri et al., 2012; Alam & Nazmoon, 2019). Also, this study found that bank size positively impacts bank performance which is consistent with some previous studies (Mehrjardi, 2012; Akinyomi & Olagunju, 2013; Dogan, 2013; and Ngumo et al., 2017). However, it contradicts the study of Olawale et al. (2017), who found that firm size negatively impacts bank performance. On the other hand, Abubakar (2021) and Sudrajat and Daud (2020) found that bank size does not have a significant relationship with the financial performance of firms. Furthermore, interacting the cost-to-income ratio with capital adequacy and bank size exerts both positive and negative impacts on bank performance in Nigeria.

One of the crucial contributions of this study to existing literature lies in examining the effect of cost-to-income ratio on banks performance of tier 1 and tier 2 banks. The results showed that the CIR of both tier 1 and tier 2 banks have an inverse relationship with bank performance. However, in terms of size effect, the tier 2 banks showed more negative impact than the tier 1 banks. Thus, with a high cost-to-income ratio, the performance of the tier 1 banks is better than the tier 2 banks, implying that the tier 1 banks are more cost-efficient. Based on the findings, the low performance of banks could result from a higher cost-to-income ratio. Hence, inefficient management of Nigerian tier 2 banks' resources could result in low earnings.

Therefore, banking regulators should set an industry benchmark for banks' cost-to-income ratio and use it to measure banks' performance. Bank operators should continuously implement strategies that will lead to improved efficiency. Banks should explore cost reduction measures such as shared services, outsourcing, and even co-locating their Information Technology infrastructures, all geared towards effective cost management without compromising the standard and quality of service delivery. Given the greater impact of high CIR on tier 2 banks than the tier 1 banks, the former should digitalize some critical areas of their operations and services to reduce operating costs. Inefficient resource management could result in diseconomies of scale for tier 2 banks. Also, banks should continuously work to improve the quality of their assets.

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