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LIQUIDITY RISK AND BANK PROFITABILITY IN NIGERIA

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ABSTRACT

The Nigerian banking crisis in the post consolidation era has been attributed to risks that were not properly managed by many banks. Bank's liquidity is one the major factors that determine success or failure of the banks in reaching its goals, and dramatic and sudden changes in the bank liquidity can lead to financial crisis and bankruptcy. This study investigated the impact of liquidity risk on the profitability of deposit money banks in Nigeria. Time series dataset which covers the period of 2010Q1 to 2022Q2 was used. The annual data was sourced from the Financial Statement of Banks and the Central Bank of Nigeria Statistical Bulletin. The research design employed for the study was the Ex-post facto method. Using correlation and ex post facto research design, it was found that liquidity ratio, loan-to-deposit ratio and cash reserve ratio had insignificant impact on bank performance. The study recommends that should develop contingency plan that will address shortfall in liquidity during periods of Central Bank rate hikes and the Federal Government should provide basic social amenities for production to strive in order to reduce the exposure of banks in Nigeria to loan defaults.

KEYWORDS: *Liquidity Risk, Bank Profitability, Return on Equity*

1. INTRODUCTION

Over the years, the issue of liquidity has impede on smooth operations of many financial institutions in Nigeria. One of the major factors that has fueled challenge is due to the over reliance on government central bank credits as their major sources of stable funding (Muhammed, 2015). As a result, many attempts by the banking regulators to ensure stability and sustainability of the banking industry have not achieved targeted objectives (Sanusi, 2011). In fact, the liquidity insurance role of banks however exposes them to the risk that they will have insufficient cash to meet random demands from their depositors and borrowers. It is therefore important to mention that liquidity is crucial to the profitability of any bank, as illiquidity or over liquidity can have adverse effects on even well capitalized banks.

According to Barlevy (2014) most deposit money banks in Nigeria engage in highly risky business such as foreign exchange trading, oil gas business, stock market margin finance as their major source of earnings, especially, when they have high liquidity influx. This was why Sanusi Lamido; a former governor of the Central Bank of Nigeria (CBN) in 2011 stated that the abundant liquidity into the banks had led to excessive lending by the Nigerian banks which subsequently resulted to loan growth and loan concentration in the oil and gas business and margin finance. Consequently, the high risk-taking behaviour of some banks has led to the taking over of Afribank, Finbank, Intercontinental bank, Oceanic bank and Union bank by the Central Bank of Nigeria due to insolvency. Recently, Sky bank and Diamond bank have been taken over by the Polaris bank and Access bank, respectively.

Extant research on liquidity risk management requires banks to have sufficient liquidity to meet up with depositors and investors demand of funds (Arif & Anees 2012; Diamond & Rajan, 2001). That bank creates liquidity by transforming illiquid loans into demand deposit which is given to investors in the forms of credits lines and loans commitment to invest in the markets of securities hence creating markets liquidity. Ford (2009) as cited by Xu (2012) argued that stress testing in analyzing the future possibility of liquidity exposure will help banks to mitigate the liquidity risk and ensure stability in financial performance of banks. Liquidity risk is a balance sheet risk that concern

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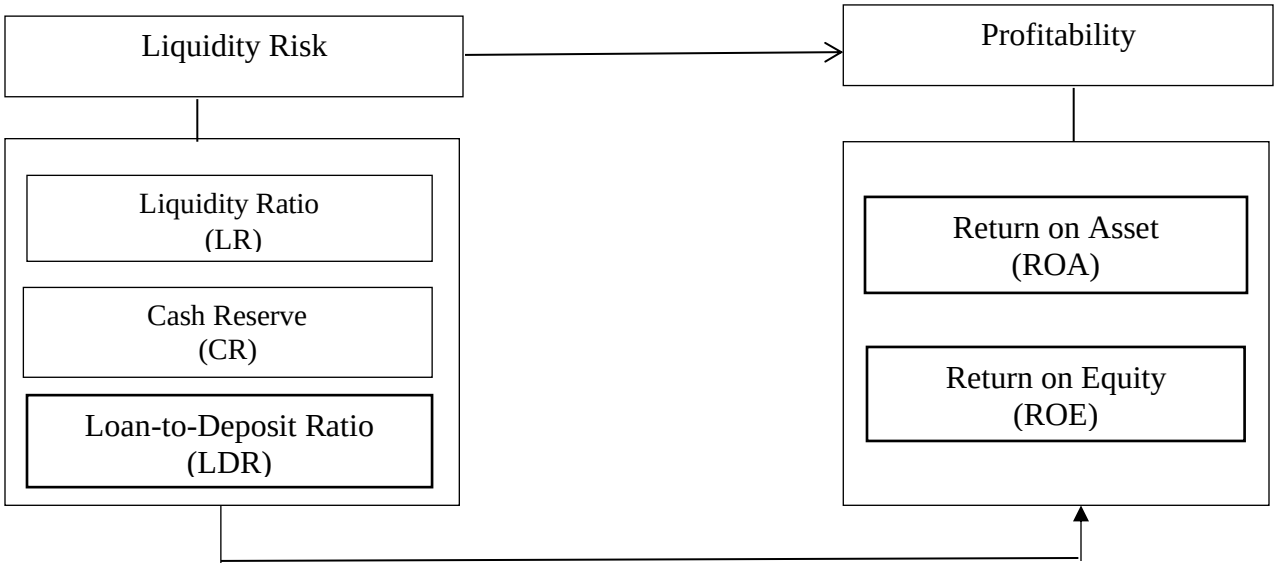
with the activities of banks on both sides of balance sheet. On the asset side, it enhances the flow of cash by lending it to the deficit unit, whereas the surplus unit saves its money on the liability side (Arif & Anees 2012).

Liquidity is the ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses (Basel Committee on Banking Supervision, 2008). The inability of banks to raise liquidity can be attributed to a funding liquidity risk that is caused either by the maturity mismatch between inflows and outflows and/or the sudden and unexpected liquidity needs arising from contingency conditions (Duttweiler, 2009). Therefore, efficient and effective liquidity management is crucial if the survival and prosperity of organizations firms is to be assured. However, as noted by Sardakis et al. (2007), the assessment of liquidity management practices, especially, in small firms and its influence on the firms' profitability has tended to be based solely on the standards and practices used by large companies or those adopted by professionals such as accountants, consultants, banks, etc. Liquidity management can be defined as the planning and controlling of cash flow by owner-managers in order to meet their day-to-day commitments (Collis and Jarvis, 2010)

Conceptually, liquidity risk is the outcome from the disparity involving the maturities of the two sides of the balance sheet. It may arise from maturity mismatches where liabilities have a shorter tenor than assets (Acharya and Naqvi, 2012). In other words, liquidity risk refers to the possibility that depositors will withdraw deposits from a bank in excess of its ability to obtain those funds except at considerably higher than normal costs. A sudden rise in the borrowers' demands above the expected level can lead to shortages of cash or liquid marketable assets Where crisis develops in a bank as a result of other problems such as deterioration in asset quality, the time available to the bank to address the problem will be determined by its liquidity. Therefore, the optimization between financial performance and liquidity risk is the most vital activities of banks. The main objective of the study is to determine the effects of different types of liquidity risks on profitability of deposit money banks in Nigeria between 2010 and 2020 in order to sustain the stakeholders and depositors' confidence in the banking industry.

Conceptual Framework



Source: Research Desk, 2023; as adopted from Nengjiu & Hayne, 2009; Mand, Sharma & Mathur, 2012.

Fig 1.1: Conceptual Framework of the Research

2. LITERATURE REVIEW

2.1 Theoretical Foundation

2.1.1 Risk-Return Theory

Banking is both risk-taking and profit-making business, and bank activities should return profits commensurate with their risk. Although this theory is intellectually sound and almost universally accepted by bankers and regulators, but banks have had difficulty implementing it in Nigeria. Traditional theory of risk return can be applied under the condition of risk. The theory posits that the higher the risk the higher the return and vice versa. This suggests that banks virtually all circumstances are expected to behave rationally. Therefore, conventional economic wisdom suggests that risk-return is positive (Sohaimi, 2013). Existing research studies have largely supported a positive risk return relationship.

Given that performance will depend on level of risk (high or low). The higher the risk, the higher will be the financial performance and vice versa. This postulation is true when the banks risk appetite is lower than the risk tolerance.

2.1.2 Risk Sensitivity Theory

Risk sensitivity theory provides an account on how reference point conceptualized as minimal acceptable requirement or need may affect risky choice (Sanya, Mitchell and Kantengwa, 2012). According to the theory, decision makers should prefer high risk option in situation of high need of performance when low risk options are unlikely to meet the financial performance. The need of performance refers to the disparity between deposit money banks.

In the course of modeling of financial performance and risk, the theory of risk-return is used. The conceptual framework of the theory postulated that the higher the risk the higher the financial performance, if the risk appetite of the bank is lower than the risk tolerance. But, if the risk appetite of the bank is higher than the risk tolerance, the theory postulated that the higher risk the lower is the financial performance (Schroeck, 2002).

2.2 Conceptual Framework

2.2.1 Concept of Liquidity Risk

According to Olagunji, Adeyanju and Olabode (2011), liquidity refers to the ability of a bank to ensure the availability of funds to meet financial commitments or maturing obligations at a reasonable price at all times. Put differently, bank liquidity means banks having money when they need it particularly to satisfy the withdrawal needs of their customers. The survival of deposit money banks depends greatly on how liquid they are, since illiquidity, being a sign of imminent distress, can easily erode the confidence of the public in the banking system and results to run on deposit.

Liquidity risk has many definitions in the literature; however, most of the definitions of liquidity risk concentrate on the counterparty to a transaction. In this sense the term means the risk inherent in the fact that the counterparty may not be able to pay or settle the transaction even if they are in good financial standing, because of a lack of liquidity (Petria & Petria, 2009). According to Adebayo et al (2011) liquidity risk is the ability of a bank to fund increases in assets and meet obligation as they come due, without incurring unacceptable losses. The fundamental role of banks in the maturity transformation of short-term deposit into long-term loans makes banks inherently vulnerable to liquidity risk.

While, Ariffin (2012) argued liquidity risk means risk that arises from maturity mismatches whereby liabilities have a shorter tenor than assets. Also, Tabari, Ahmadi and Emami (2013) refers to liquidity risk as the inability of the bank to manage its liquidity position in order to cover mismatch between future cash outflow and cash inflow. In the context of this study, it defines *liquidity risk* as the risk of losing *earnings and capital gain* due to an inability to meet obligations (liabilities) in a timely manner when they become due. According to Uremadu (2012) liquidity risk management as the ability of bank to own sufficient liquidity or cash to meet up with unexpected demand from depositors so that bank can continue to perform its duties. Sohaimi (2013) also, argued that liquidity risk is reduced if a bank holds greater levels of current assets. Evidently, current assets have less volatile return than long-term assets. Sohaimi (2013) however argued that banks that have greater holdings of short-term liabilities (deposits and purchased funds), are potentially exposed to liquidity problems if asset quality declines.

2.2.2 Bank Profitability

A general measure of how well a bank generates revenues from its capital. It also shows a bank's overall financial health over a period of time, and it helps to compare different banks across the banking industry at the same time (Nigerian Deposit Insurance Corporation 2016). As an individual bank, it would be important to start with its income statement for better understanding of how well it is operating, which describe the sources from income and expenses representing its profitability (Eljelli, 2004). Operating income is the income which is from bank's ongoing operation. Mostly, it comes from bank's interest with its assets, particularly loans. Meanwhile, noninterest income comes from partly service charges on deposit accounts, but mostly comes from the off-balance sheet activities that create fees or profits for the bank (Anyanwu, 1993).

Operating expenses are expenses incurred as a result of bank's ongoing operations. Mostly, it is the interest payment for its liabilities, particularly with its deposits. Meanwhile, noninterest expenses cover the cost of its business running such as salaries, rent, equipment and cost of computer services, etc. Besides, an item named provision for loan losses played an important role within the financial crisis. When a bank has a bad debt or expected bad debt in the future, it needs to be written as a loss (Aburime, 2008).

2.2.3 Liquidity Risk and Performance Bank

Liquidity simply means the ability of the bank to maintain sufficient funds to pay for its maturing obligations. It is the banks' ability to immediately meet cash, cheques, and other withdrawal obligations and legitimate new loan demand while abiding by existing reserve requirements. Liquidity management therefore is the strategic supply or withdrawal from the market circulation the amount of liquidity Consistent with desired level of short–term reserve money without distorting the profit making ability and operations of the bank (Dietrich & Vollmer, 2010). Generally, the adequacy of liquidity plays very crucial roles in the successful functioning of all business firms. The ability to meet short-term obligations may affect the firm's operations. Every investor has interest in the liquidity position of the company.

However, the issue of liquidity though important to other businesses, is most paramount to banking institutions and this explains why bank show-case cash and other liquid securities in their balance sheet statement. Thus, bank ensures that sufficient provision of cash and other near cash securities are made available to meet withdrawals obligation and new loan demand by customers in need of liquidity (Dietrich & Vollmer, 2010). Hence, banks in Nigeria are statutorily required to comply with Cash Reserve Requirement (CRR) policy of the Central Bank of Nigeria as a measure of effectively managing the liquidity position of banks

2.3 Empirical Review

The effect of liquid asset holdings on the profitability of U.S. and Canadian banks was investigated by Bordeleau and Graham (2010). The empirical results from ordinary least squares regression analysis of panel data of the banks suggested that profitability is improved for banks that hold some liquid assets. However, there is a point at which holding –further liquid assets minimizes a bank's profitability, all else equal. Furthermore, the empirical results from the study also indicated that this relationship varies depending on a bank's business model and the state of the economy. Imad, Kilani and Kaddumi (2011) studied a balanced panel data set of Jordanian banks for the purpose of investigating the nature of the relationship between the profitability of banks and their liquidity level for ten banks over the period 2001 to 2010. Using two measures of bank's profitability: the rate of return on assets (ROA) and the rate of return on equity (ROE), the results showed that the Jordanian bank's liquidity explain a significant part of the variation in banks' profitability. High Jordanian bank profitability tends to be associated with well-capitalized banks, high lending activities, low credit risk, and the efficiency of credit management. Results also showed that the estimated effect of size did not support significant scale economies for Jordanian Banks.

Arif (2012) tested liquidity risk factors and assessed their impact on 22 banks in Pakistan between 2004 and 2009. Findings of the study indicated that there is a significant impact of liquidity risk factors on the banks dependence on the central bank in meeting the customers' obligations and profitability is negatively affected by the allocation of non-performing loans and liquidity gap. The relationship between liquidity and the profitability of banks listed on the Ghanaian Stock Exchange was investigated by Lartey, Antwi and Boadi (2013). The study was carried out on seven of the nine listed banks. The researchers made use of the longitudinal time dimension model. Specifically the panel method time series analysis and profitability ratios were computed from the annual financial reports of the seven

banks. The trend in liquidity and profitability were determined by the use of time series analysis. It was revealed that for the period 2005 to 2010, both liquidity and profitability had a downward trend. The main liquidity ratio was regressed on the profitability ratio. The result revealed that there was a positive and statistically significant relationship between liquidity and profitability of the listed banks.

Almazari (2014) investigated the internal factors that have an effect on profitability in Saudi and Jordanian banks. He found that there is a positive correlation between profitability measured by ROA of Saudi and Jordanian banks with some liquidity indicators, as well as there is a negative correlation with other liquidity indicators between profitability measured by ROA of Saudi and Jordanian banks. Lipunga (2014) evaluated the determinants of profitability of listed commercial banks in developing countries specifically focusing on Malawi during the period. 2009-2012 using internal-based and external (market)-based profitability measurements. The study employed correlation and multivariate regression analysis. Return on Assets (ROA) and Earnings Yield (EY) are used as proxies of internal and external profitability respectively. The results of the regression analysis suggest that bank size, liquidity and management efficiency have a statistically significant impact on ROA however capital adequacy has insignificant effect. On the other hand results suggest that earnings yield is significantly influenced by bank size, capital adequacy and management efficiency, whereas liquidity is found to have insignificant influence on Earnings yield.

Kurotamunobaraomi, Giami and Obari (2017) empirically investigated the interrelationship between liquidity and corporate performance of banks in Nigeria with the use of annual data from 1984 to 2014. The work utilized Cash Reserve Ratio, Liquidity Ratio and Loan-to-Deposit Ratio as proxies for liquidity; and Return on Shareholders' funds as the proxy for performance and applied finometric analyses that include Ordinary Least Square Regression, Johansen Cointegration, Granger Causality test and Error Correction Model. Empirical results indicate a significant negative short-run relationship between Cash Reserve Ratio and corporate performance as well as a positive relationship between Loan to Deposit Ratio and Liquidity Ratio on one hand and corporate performance on the other albeit significantly and insignificantly respectively. Also, Cash Reserve Ratio and Liquidity Ratio are statistically significant enough to influence Return on Shareholders' Fund in the long run, while the Loan-to-Deposit Ratio exhibits complacency in instigating Performance in deposit money banks in Nigeria; a position corroborated by the Causality results, implying that other factors could be responsible for banks' performance such as industry structure and government policies or regulations. Consequently, it is recommended that regulators such as the Central Bank of Nigeria may need to deliberately reconsider banks' capital reserves ratio as negative relationship found in this study points towards that direction in order to increase the corporate performance of banks, banks should avoid excess liquid assets, banks should fully utilize the loan to deposit ratio by increasing marketing effort.

Daniel (2017) impact of liquidity management on the performance of deposit money banks, twenty four banks were surveyed which constitute the entire deposit money banking industry in Nigeria between 1986 and 2011. Secondary data were collected and analysed using SPSS. The study uses descriptive, correlations and inferential statistics. Bank performance in terms of profitability is measured by its return on equity. Three hypotheses are formulated and statistically tested at 5 per cent level of significance using Multiple Linear Regression Analysis. Findings from the empirical analysis show that there is a significant relationship between liquidity management and the performance of Deposit Money Banks in Nigeria. The correlation results reveal positive impacts between return on equity and liquidity management variables: liquidity and cash reserve ratios, whereas loan to deposit ratio shows negative impact. However, the key results indicate that only the banks with optimum liquidity were able to maximize returns. The study concludes that illiquidity and excess liquidity pose problem to bank management operations and recommends that bank should adopt optimum liquidity model for efficiency and effectiveness.

Akinwumi, Essien and Adegboyega (2017) examined the liquidity management on profitability of banks in Nigeria between 2007 and 2016, using Pearson correlation coefficient technique. The empirical results revealed that there is a statistically significant relationship between banks' liquidity, return on asset and return on equity. However, the relationship is not all that statistically significant when return on asset was used as proxy for profitability. It was suggested that the banks should evaluate and redesign their liquidity management strategy so that it will optimize returns to shareholders equity and also optimize the use of the assets. The study showed that good management and control of factors influencing the liquidity of commercials banks in the country could improve the financial performance of banks.

Olagunju, Adeyanju and Olabode (2011) examined liquidity management and commercial banks' profitability in Nigeria by analyzing both primary and secondary data. The results indicate that the profitability of commercial banks is significantly influenced by their liquidity and vice versa. Fadare (2011) employed a linear least square model and time series data from 1980 to 2009 to examine the determinants of Banking Sector liquidity in Nigeria and assesses the extent to which the recent financial crises affected liquidity in deposit money banks in the country. The findings indicate that only liquidity ratio, monetary policy rate and lagged loan-to-deposit ratio are significant for predicting Banking Sector liquidity; and that a decrease in monetary policy rates, liquidity ratios, volatility of output in relation to trend output, and the demand for cash, leads to an increase in current loan-to-deposit ratios; while a decrease in currency in circulation in proportion to Banking Sector deposits; and lagged loan to deposit ratios leads to a decline in current loan-to-deposit ratios. The result suggests that during periods of economic or financial crises, deposit money banks are significantly illiquid relative to benchmarks, and getting liquidity monetary policies right during these periods is crucial in ensuring the survival of the Banking Sector.

3. MATERIALS AND METHOD

For this study, time series dataset which covers the period of 2010Q1 to 2022Q2 was used. The annual data was sourced from the Financial Statement of Banks and the Central Bank of Nigeria Statistical Bulletin. The research design employed for the study was the Ex-post facto method. The study used this due to the nature of our series as they are historical data and therefore, cannot be manipulated (Onwumere, 2009).

Bank profitability is measured as the return on asset (ROA), while liquidity risk was proxy using three measures of liquidity ratio (LR), loan-to-deposit ratio (LDR) and cash reserve ratio (CRR). In line with existing literature, the study defined bank performance as a function of liquidity ratio (LR), loan-to-deposit ratio (LDR) and cash reserve ratio (CRR). The functional form of the model adopted is given as:

$$ROA = f(LR, LDR, CRR) \qquad (1)$$

Where:

$ROA = Return\ on\ asset$;

$LR = Liquidity\ ratio$;

$LDR = Loan - to - deposit\ ratio$; and

$CRR = Cash\ reserve\ ratio$

In line with prevailing literature, the econometric transformation was made to equation 1. Equation 1 is transformed as:

$$ROA_t = \alpha_0 + \alpha_1 LR_t + \alpha_2 LDR_t + \alpha_3 CRR_t + \mu_t \qquad (2)$$

The empirical analysis is carried out using equation (2).

The a priori expectation is that: $\alpha_1 - \alpha_2 > 0$; $\alpha_3 < 0$.

To achieve the objective of the study which is to examine the effect of liquidity risk on bank performance, various econometric techniques were employed. Essentially, the descriptive statistics on each of the series was carried out to understand the distributional properties of the data series. The identification of the order of integration of the variables was carried out through unit root testing for which the study adopted the augmented Dickey-Fuller (ADF) (1979) test. The determination of long run relationship between the variables was carried using the cointegration method of bound test developed by Pesaran, Shin and Smith (2001). In addition, the impact of liquidity risk on bank performance in the long run and short run is investigated using the autoregressive distributed lag (ARDL) method. The ARDL method was chosen because of the nature of the variables as unit root test carried out showed the variables are integrated of mixed orders of I(0) and I(1).

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The autoregressive distributed lag (ARDL) model specification is expressed as:

$$\Delta ROA_t = \alpha_0 + \sum_{i=1}^{r} \alpha_1 \Delta ROA_{t-i} + \sum_{i=0}^{s} \alpha_2 \Delta LR_{t-i} + \sum_{i=0}^{s} \alpha_3 \Delta LDR_{t-i} + \sum_{i=0}^{s} \alpha_4 \Delta CRR_{t-i} + \delta_1 ROA_{t-1} + \delta_2 LR_{t-1} + \delta_3 LDR_{t-1} + \delta_4 CRR_{t-1} + \mu_t \quad (3)$$

Where;
r and s = lag length for the explained variable and regressors, respectively
Δ = first differencing operator
μ_t = error term
α_1 - α_4 = short-run coefficients
δ_1 - δ_4 = long-run coefficients
α_0 = constant
The error correction model is expressed thus;

$$\Delta ROA_t = \alpha_0 + \sum_{i=1}^{r} \alpha_1 \Delta ROA_{t-i} + \sum_{i=0}^{s} \alpha_2 \Delta LR_{t-i} + \sum_{i=0}^{s} \alpha_3 \Delta LDR_{t-i} + \sum_{i=0}^{s} \alpha_4 \Delta CRR_{t-i} + zECM_{t-1} \quad (4)$$

Where;
z = the model speed of adjustment.

4. RESULTS AND DISCUSSION

Table 1: Descriptive Statistics of Variables

	ROA	LR	LDR	CRR
Mean	1.7309	48.5966	60.9614	18.0200
Median	1.7422	46.4550	60.9533	22.5000
Maximum	2.4304	87.9267	81.7600	29.0000
Minimum	0.1217	18.5133	33.3900	1.0000
Std. Dev	0.4108	14.8804	12.5871	8.8672
Skewness	-1.2396	0.3546	-0.1890	-0.6770
Kurtosis	6.7095	3.0106	2.3886	2.1874
Jarque-Bera	41.4756	1.0483	1.0762	5.1958
Prob.	0.0000	0.5920	0.5838	0.0744
Observation	50	50	50	50

Source: Author's computation (2023)

The statistics on the interest variables are presented in Table 1. Averagely, return on asset was 1.7309 percent and this range between 0.1217 and 2.4304 percent. Liquidity ratio averaged 48.5966 percent. During the investigation period, liquidity ratio fell to 18.5133 percent and peaked at 87.9267 percent. Loan-to-deposit ration averaged 60.9614 percent. Loan-to-deposit ratio was lowest at 33.39 percent and rose to 81.76 percent. On the averaged, the cash reserve ratio was 18.02 percent. The period saw declining in cash reserve ratio to 1.00 percent and peaked at a high of 29.00 percent. The study observed wild fluctuation in liquidity ratio, loan-to-deposit ratio and cash reserve ratio as reflected in their standard deviation statistics. There has been increase in liquidity ration and decline in loan-to-deposit and cash reserve ratio as shown in their respective skewness statistics. Also, performance of deposit money banks (DMBs) in Nigeria has decline over time as shown by the skewness value of -1.2396. The summary statistics on the interest variables revealed that all the variables except return on asset and liquidity ratio have kurtosis values below 3. From the statistics, only return on asset and liquidity ratio are leptokurtic. Table 1 showed that liquidity ratio, loan-to-deposit ratio and cash reserve follow a normal distribution, while the null hypothesis of normal distribution for return on asset was rejected.

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Unit Root

Table 2: Unit Roots Result

Variable	Augmented Dickey-Fuller (ADF)			I(d)
	Level	1st Diff	5% Critical Value	
ROA_t	-4.0037***	-	-2.9281	I(1)
LR_t	-2.0899	-6.2630***	-2.9224	I(1)
LDR_t	-2.2751	-5.1248***	-2.9237	I(0)
CRR_t	-1.6451	-6.1566***	-2.9224	I(0)

Note: *, **, and *** denote significance at 10%, 5% and 1%, respectively
Source: Authors' compilation (2023)

The pre-estimation test of unit root, presented in Table 2 and based on the augmented Dickey-Fuller (ADF) procedure, revealed that the ADF statistic for liquidity ratio, loan-to-deposit ratio and cash reserve ratio are higher than the 5 percent critical values, respectively. This denote that, liquidity ratio, loan-to-deposit ratio and cash reserve ratio are non-stationary in their level form. However, stationarity of liquidity ratio, loan-to-deposit ratio and cash reserve ratio was found after first difference, implying that liquidity ratio, loan-to-deposit ratio and cash reserve ratio are first difference stationary, and integrated of order one, I(1). Return on asset was shown to be stationary at levels, as the ADF statistics, in level form, was below the 5 percent critical value. This test showed that the interest variables are level stationary and first difference stationary, providing the basis for employing the autoregressive distributed lag (ARDL) method for estimation.

Cointegration

Table 3: Bounds Test Co-Integration Result based on F-statistics

Significant Level	I(0) Bound	I(1) Bound	Value
10%	2.37	3.2	F-Stats = 4.511162**
5%	2.79	3.67	k = 3
2.5%	3.15	4.08	
1%	3.65	4.66	

Note: *K* denotes regressors in the model. (Null Hypothesis: Series are not cointegrated). *, ** and *** denote significance at 10%, 5% and 1% level, respectively.
Source: Author's computation (2023)

As shown in Table 3, the calculated F-statistics of 4.51162 is greater than the upper bound value at 5 percent level of significance that is 3.67. Following Pesaran, et al., (2001) guideline which stipulates the presence of long-run relationship in the event of the F-statistics is greater than the upper bound value at preferred level of significance, the study conclude that at a significance level of 5 percent, a long-run relationship exist between liquidity ratio, loan-to-deposit ratio, cash reserve ratio and return on asset.
With the confirmation of long run relationship between the variables, the equilibrium correction model (ECM) can be estimated to examine the dynamics of the variables in the short run and ascertain the speed at which the ARDL model (1, 0, 4, 0) converge to long run equilibrium.

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Model Estimation

Table 4: ARDL Long and Short Run Results

Dependent Variable: ROA_t				
Panel I: Long Run Results				
Variable	***Coefficient***	***Std. Error***	***t − Stats***	***Prob.***
LR_t	0.0033	0.0072	0.4683	0.6423
LDR_t	-0.0103	0.0101	-1.0158	0.3163
CRR_t	-0.0037	0.0181	-0.2071	0.8370
C	2.2588	0.6239	3.6204	0.0009
Panel II: Short Run Results				
Variable	***Coefficient***	***Std. Error***	***t − Stats***	***Prob.***
$D(LT_t)$	0.0021	0.0046	0.4650	0.6446
$D(LDR_t)$	-0.0120	0.0116	-1.0364	0.3067
$D(LDR_{t-1})$	-0.0012	0.0159	-0.0771	0.9390
$D(LDR_{t-2})$	0.0314*	0.0160	-1.9616	0.0574
$D(LDR_{t-3})$	0.0317***	0.0104	3.0409	0.0043
$D(CRR_t)$	-0.0023	0.0115	-0.2075	0.8368
ECM_{t-1}	-0.6367***	0.1381	-4.6088	0.0000
$R^2 = 0.4572$		Adjusted $R^2 = 0.4043$		

Note: *, ** and *** denote significance at 10%, 5% and 1% level.
Source: Author's computation (2023)

The result of the ARDL model (1, 0, 4, 0) is presented in Table 4. Evidence from the analysis carried out and reported in Table 4 disclosed that liquidity ratio increases bank performance in the long run, in line with economic postulation. The probability value of the parameter revealed that the positive relationship between liquidity ratio and bank profitability is insignificant as a one percent increase in liquidity ratio leads to a 0.0033 percent increase in bank performance. Loan-to-deposit ratio was found to have a negative relationship with bank profitability in the long run as an increase in loan-to-deposit one percent results in a decrease in bank profitability by 0.0103 percent. The negative relationship established following the estimated long run model is insignificant at the 5 percent level indicating that loan-to-deposit ratio is incapable of improving bank profitability in Nigeria.

In similar vein, the established long run relationship between cash reserve ratio and bank performance is negative and insignificant following the revelation of the estimated long run model. From the result presented in Table 4, a one percent increase in cash reserve ratio will result in or produce a 0.0037 decrease in bank profitability.

Table 4 also present the short run dynamics for the ARDL (1, 0, 4, 0) model. The coefficient of determination of 0.4572 indicates that the explanatory variables or determinants explain 45 percent of the total variation in current level of bank profitability and the difference of 55 percent is explained by other determinants of bank profitability not considered, but captured by the error term. The short run regression result reveals that loan to deposit ratio had significant positive relationship with bank performance, with the effect taking three quarters to materialize. Table 4 reveal that any short run disturbances that cause the ARDL model (1, 0, 4, 0) to deviate from the long run bank profitability will be corrected at the speed of 63 percent in the following quarter.

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Diagnostic Test

Table 5: Diagnostic Test Results

Test	Null Hypothesis	Test Type	Test Stat.	Prob.
Autocorrelation Test	Serial Correlation does not exist	Breusch-Godfrey LM Test	3.5062	0.1732
Heteroscedasticity Test	Homoscedasticity exists	ARCH	0.0128	0.9097
Normality Test	Residuals are normally distributed	Jarque-Bera	0.5448	0.7615

Source: Author's Computation (2023)

The post-estimation test result of the model presented in Table 5 shows the errors are not serially correlated. The chi-square Breusch-Godfrey LM test statistics of 3.5062 and associated probability value of 0.1732 led to the study accepting the null hypothesis that the errors are not serially correlated. The calculated Chi-square statistics of 0.0128 and probability value of 0.9097 for the ARCH statistics indicated that the study could not reject the null hypothesis for constant variance of the errors, which means the errors are homoscedastic. The second order test of normality revealed that the errors are normally distributed. Also, the stability of the short run and long run coefficients were confirmed. The plot of cumulative sum (CUSUM) as presented in Figure 1 shows that the CUSUM statistics are within the 5 percent critical bounds implying that the estimated ARDL model is stable and devoid of any structural break.

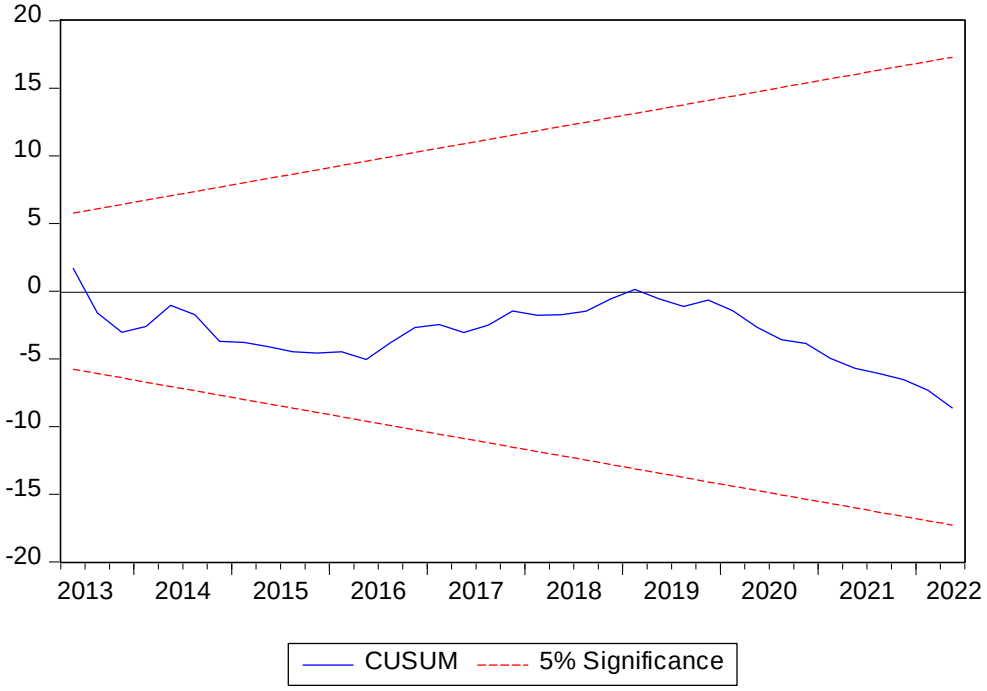

Figure 1: Cumulative Sum (CUSUM) Plot

5. CONCLUSION AND RECOMMENDATIONS

This study examined the nexus between liquidity risk and bank profitability in Nigeria. Arising from the estimation conducted using the autoregressive distributed lag (ARDL) method, it was evident that liquidity risk does not affect the profitability of banks in Nigeria. The results showed that liquidity ratio, loan-to-deposit ratio and cash reserve ratio had insignificant impact on bank performance. The study recommends that should develop contingency plan that will address shortfall in liquidity during periods of Central Bank rate hikes and the Federal Government should provide basic social amenities for production to strive in order to reduce the exposure of banks in Nigeria to loan defaults.

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