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Bank's Liquidity and Stability: An Endogenous Examination

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I. INTRODUCTION

The banking sector according to Bagh, Khan, Azad, Saddique and Khan (2021) is the financial institutions' backbone of the economy because of the significant prospect it has on the economic growth and development, the most apparent and paramount of which is the intermediation role. Banks are special financial institutions because of this intermediary role of channeling savings from the surplus unit and lending to the deficit unit for investment purposes, and other economic activities, as well as facilitating the payment for goods and service.But efficient financial intermediary cannot be possible if banks are not liquid. Liquidity is a cardinal measure of bank's performance and its survivor; it makes the bank to earn a substantial proportion of incomes, to absorb any financial losses arising from its operations,to plays its role in the growth of the economy, and to maintain its stability (soundness) (Mgbodile, 2019).Ibe (2019), described bank's liquidity as the ability of the bank to immediately meet cash, cheques, other withdrawals obligations, and legitimate new loan demands while abiding by existing reserve requirements.The funding and the creation of liquidity are the two important functions that may determine the long-term financial stability of the banking industry. In funding the liquidity, managers maintain sufficient liquidity to meet the short-term financial obligations and reduce the risk of cash flow shock (Duong & Nguyen, 2021; Gennotte& Pyle, 2023). Keynes and Waeger (1930) stated that decisions to invest in liquid assets are driven by cash flow need for routine business transactions, to avail any investment opportunities, and reduce the risk of future cash flow shocks; while the creation of liquidity reflects a bank's ability to generate the funds in due time and convert the assets into cash without losing their real value (Gertler et al., 2018). In addition, banks on their own still retained or reserves part of their profits as cash, revenue and capital (Tier II capital) during routine business operations to maintain banks' stability. Stability is of utmost concerned to regulators than performance; only a stable bank can exist to perform. Liquidity is thus a key variable not only in the banking sector but also in all business enterprise. A business without liquidity flows cannot always operate to success, so banks without adequate or reserved capital, cash equivalent, and liquid assets will be prone to liquidity crises; hence the Central Bank of Nigeria (CBN) is always particular about the term liquidity in deposit money banks.Consequently, this paper therefore aimed to examine the impact of cash-capital reserves, loan-to-deposit ratio, and assets-government securitieswhich capture and quantify the dynamics of liquidity flows (expansion or contraction) impact on bank's stability between 2005 and 2024 in Nigeria's deposit money banks.

1.1 Statement of Research Problem

Banks, like every other business firms are set up mainly to earn profit. But profitability cannot be achieved without optimum stability. Bank stability is the smooth functioning of the banking activities to earn profit by mitigating the risk of bank's failure, banking runand financial distress (Luong & Nguyen, 2021). However, in the pursuance of this profit initiative, banks make loans that cannot be sold quickly at a high price and also issue demand deposits that allow depositors to withdraw at any time. Such a mismatch ofliquidity in which banks' liability are more liquid than its assets cause's problem for when too many depositors call for or makes demands for their deposits it affects banks' liquidity position. Also, many banks have investments in safe and high yielding illiquid assets but are tied up in loans, but some banks despite having lots of assets, the sudden withdrawals and lack of liquid funds can lead to huge loss.Liquidity flows in banks have therefore posed several challenges in Nigeria during the banks' distressed syndrome, banks' closures, and outright bought over in less than five years of their establishment during the era of free (indigenous) banking between 1892 and 1952, 1954;closures, distressed, and bought over eras of the 1980s, 1990s, 2000s; the global financial crisis of 2007 to 2008, and of recent 2020s; all had liquidity related problems where some banks had to raise funds at very high discount rate in order to

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meet up with the high pressure of demands for urgent cash. However, the use of unconventional monetary policy measures such as quantitative easing raised concerns about the potential long-term effect on the stability of the financial institutions. Also, interbank lending which is a key mechanism for the transfer of liquidity between financial institutions; however, during times of financial stress, interbank lending may become constrained, leading to liquidity shortages and potential systemic risk (Muhammed, 2021). In line with this, regulatory frameworks can have a significant impact on the flow of liquidity within the financial system, for example, regulations that require banks to hold larger liquidity buffers may help to reduce the risk of liquidity shortages, but they may also increase costs and reduce the availability of credit; as a corollary, Ozili (2020) viewed the absence of credit supply and lack of payments to customers is the main challenges to banks' performance caused by inadequate liquidity. Thus, Soludo (2004) opined that the problem with so many unsound deposit money banks included amongst others, persistent illiquidity; the question now is, does liquidity flows have any significant impact on bank's stability since the cash is idle, or put into use to generate income?

There are few previous studieslike the studies by Zhang, et al,. (2022), they investigated the impact of liquidity on long-term bank stability adopting financial fragility hypothesis and risk absorbing hypothesis; and Acharya and Viswanathan (2019), examined the relationship between bank funding and liquidity creations and their impact on bank stability. Both studies show different results. This study wants to investigate further, and add to the few previous ones; thus the basis and the need for this study.

1.2 Research questions

Following the statement of research problems, the following research questions emanated.

i. Does Bank's liquidity have significant impact on bank's stability in Nigeria?
ii. Is there a significant impact of Loan-to-deposit ratio on bank's stability in Nigeria?
iii. Does banks' cash-capital reserves impact on banks' stability?
iv. Does assets-government securities held by banks impact on bank's stability in Nigeria?

1.3 Objectives of the study

The main objective of the study is to examine the impact of bank's liquidity on bank's stability. Other objectives are, to;

i. Examine the impact of bank's liquidity on bank's stability in Nigeria.
ii. Investigate the impact of loan-to-deposit ratio on bank's stability in Nigeria.
iii. Determine the impact of cash-capital reserves on bank's stability in Nigeria.
iv. Examine the impact of assets-government securities on bank's stability in Nigeria.

1.4 Statement of Hypotheses

To achieve the above objectives, the study tested the following hypotheses which are stated as Null hypotheses, that;

H_{O1}: bank's liquidity does not have a significant impact on banks' stability in Nigeria.

H_{O2}: there is no significant impact of loan-to-deposit ratio on bank's stability in Nigeria.

H_{O3}: cash-capital reserves do not significantly impact bank's stability in Nigeria, and

H_{O4}: assets-government securities do not significantly impact bank's stability in Nigeria.

II. LITERATURE REVIEW

2.1 Conceptual Literature

2.1.1 Bank's Liquidity

Liquidity refers to the overall monetary conditions, indicating the extent of mismatch between demand and supply of monetary resources (Reserve Bank of India, 2019). It could also be defined as the availability of funds, or assurance that funds would be available, to honor all cash outflow commitments (both on- and off-balance sheet) as they fall due (Bank of Jamaica, 2017). Liquidity is cash and assets kept aside to meet future financial requirements through cash flows, funding activities and required capital based.The aim of banks being liquid is to ensured that they (the banks) discharges their financial commitments as and when due. From the Central Bank perspective, liquidity refers to the liabilities of the Central Bank (especially currency and banking system reserves) otherwise called the monetary base (Gray, 2018) of which it is the sole supplier (Reserve Bank of India, 2019). To deposit money banks, however, liquidity refers to the bank's ability to meet its day-to-day obligations, which includes the availability of cash on demand. Liquidity could be in form of cash holdings, funds in the account with other banks, and the Central Bank, amongst others. It could also take the form of securities holding with short-term maturities such as government securities which could easily be traded with low transaction cost (Elliot, 2020).

Ejike and Oke (2019), view liquidity as the ability of the bank to meet periodic cash demand of customers and a measure of its strength

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and an assurance for depositors' confidence. Nwaezeaku (2016), define liquidity as the degree of convertibility to cash or the ease with which any asset can be converted to cash, that is, sold at a fair market price. In another development, liquidity is defined by Nwankwo (2021) as the ability of banks to meet every financial need of customers as at whether withdrawing from current accounts, or as loans for investment activities, etc.

Liquidity which measures the solvency and soundness of banks shows whether a bank has sufficient capital to support the credit risk and liquidity risk in its balance sheet. Oke and Ikpesu(2022) averred that a bank's liquidity is considered adequate if it is enough to cover the bank's operational expenses, satisfy customers with dual needs and protect depositors against total or partial loss of deposits. Adequate liquidity is a sine qua non to bank stability, thus the need for liquidity planning for the operations of all the financial institutions. Accordingly, Soomiyo, Bwuese, & Yua (2023)prudential guidelines on liquidity ratio set out the three main elements that determine a bank's adequate liquidity. These are credit risk and liquidity risk associated with exposures, the form and quality of assets held to support these exposures, and market risk arising from banking activities. Adequate liquidity is crucial for a bank to meet its business requirements, ensure safe operations, retain public confidence and soundness (Oke &Ikpesu, 2022).Thus, the higher the bank's adequate liquidity, the soundness the bank, and the more protection investors will have.

Liquidity in banks represents physical cash, bank balance with the Central Bank and other banks, treasury bills, treasury certificates, and other assets of a bank that can easily be converted to cash with minimum risk of loss (Adah, 2021).

Determinants of Bank's Liquidity

Fluctuating liquidity can be influenced by several variables. However, the scopes of this study covers' variables such as loan-to-deposit ratio (LDr), cash-capital reserves (CCR), and assets-government securities (AGS).

i. **Loan-to-deposit ratio (LDR)**

The Loan-to-Deposit ratio is a useful tool for assessing the funding profile of banks. It is used mainly to determine the level of liquidity of a bank and provides insight on bank's risk level, fund utilization, and intermediation activities (Rengasamy, 2020).According to Martono (2018), loan-to-deposit ratio is the ratio that determines the ability of banks in repaying liabilities to customers who have invested with credit (deposits) that have been to debtors (borrowers). According to Mulyono (2020), loan-to-deposit ratio is the ratio between the amount of funds disbursed to the community (credits) with the number of public funds (deposits), and own capital used. The LDr describes the ability of the banks to repay the withdrawals of deposits by customers by relying on the credits given as their liquidity.In other words, LDr is a ratio that shows the level of the ability of banks in channeling third party funds collected by banks. According to Rengasamy (2020), LDr gives an insight into the proportion of assets a bank can create from its liabilities. That is, all banks loans are lumped together on the basis that they are the most liquid of all banks' assets. They then compare with the total bank's deposits as a proxy for liabilities. A rise (a higher ratio) in this ratio implies a less liquid position which may affect bank lending, and a fall (lower ratio) implies a strong liquid position which enables banks to lend and invest. LDralso indicates the amount of income/profit a bank can generates.The profitability of banks will increase if the banks are distributing more funds in the form of credit to their customers so that idle funds are getting smaller and the banks will get interest from the loan distribution. LDris computed as the total value of loan facilities issued divided by the aggregate value of deposits (liabilities) mobilized (Kurotamun-Obalaomie, et al., 2017).

Research on LDr gets different results. Anggreni&Suardhika (2019) studied revealed that LDr has no effect on bank's soundness, while Almadany (2018) study shows that LDr has a negative effect on bank's soundness. Whereas, Porawuow, et al., (2021) states that LDr has a positive effect on bank's stability.

ii. **Cash-Capital reserve (CCR)**

Cash and capital reserves are the amount of funds set aside by banks for future use, or for emergence purpose. Bank capital reserves provide banks with the necessary liquidity to cover customer's withdrawals, payment settlements, and daily operational needs. Adequate cash reserves or capital reserves besides capital requirements are essential for maintaining the survival and stability of the banking system as it is one of the variables to consider in determining the liquidity status of the banks and their ability to meet due financial obligations (Umobong, 2020). They act as a buffer against unexpected economic shocks or crisis. Adequate reserves enhance the stability of the banking system, reducing the risk of bank failure and financial crisis.

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Banking crisis has renewed the attentions to the role of capital; and the cost of bank failure has justified the existence of regulatory capital requirements for financial institutions (Berger et al., 2015). Higher capital levels can allow banks to absorb larger shocks, systemic risks, bank failures and alleviate the incentives of banks' shareholders to take on excessive risk. As Spong (2013) put it, commercial banks must have enough capital to provide a cushion for absorbing possible loan losses or other problems, funds for internal needs and for expansion and added security for depositors and the deposit insurance system. In addition, higher capital serves to increase the financial stake that stockholders have in the safe and sound operations of banks.Greuning and Bratanovic (2011) have argued that in addition to serving as a safety-net for a variety of risk exposures and absorbing losses, adequate capital is a determinant of a bank lending capacity and maximum level of assets. In other words, the volume of loans and advances that a bank is capable of creating is directly related to the level of banks' capital.

iii. **Assets-Government securities (AGS)**

The banks' liquidity is created by funding the illiquid assets with the help of short-term liabilities to generate the funds in due time and convert the assets to cash without losing their (assets) real value (Brunnermeier&Pedersen, 2019; Gertler, et al., 2020). According to Olareweju and Adeyemi (2020), defined liquidity as a measure of the extent to which assets can be quickly converted to cash. They explain that liquid assets are those that can be converted to cash quickly if needed to meet financial obligations, and for financial institutions to remain stable, it must have enough liquid assets to meet its short-term obligations. Banks thus do seek high returns and makes adequate provisions by holding liquid assets (short-term assets) which they can sell quickly and without loss, to cushion the effect of uncertainty in their operations, and other various unexpected needs for liquidity. Financial assets held by banks can be categorized into:

a. Treasury bills.
b. Treasury certificate.
c. Government bonds.
d. Cash.
e. Shares.
f. Loans, and receivable and available for sale (Wikipedia).

These are sources in which funds are temporary invested or stored with the hope that they would either mature when liquidity is needed or be sellable in advance of maturity without material loss; they made up the Tier I capital as stipulated by Basei Accord. Keynes and Waeger (1936), argued that decisions to invest in liquid assets are driven by cash flow need for routine business transactions, avail the investment opportunities, and reduce the risk of future cash flow shocks. In addition, a country's banking industry regulations and central monetary authorities are also appealed to retain a required amount of liquid assets during routine business operations to maintain bank stability, for example, Basel II (Copelovitch& Singer, 2018). Onoh (2018) maintained that the volume and value of assets held by banks in their portfolio is one of the indices for assessing the earning capacity and their relative liquidity positions. A low ratio indicates high quality banks' asset portfolio while a high ratio indicates low quality asset portfolio.

The Basel 1 Accord grouped sources of banks' capital into two tiers. Tier I is made up of amongst others, equity or common stock capital, capital reserves (retained earnings), preference shares or preferred stocks, etc, while Tier II capital is made up of amongst others, loans, debts or bonds. The Basel III Accord notably proposed an increase in capital quality by requiring higher levels of common equity. It also required a minimum leverage ratio taking into account banks' total assets and off-balance sheet items (Greuning&Bratanovic, 2015).

2.1,2 Bank's Stability

Bank stability has many definitions. According to Brunnermeier et al., (2020), bank stability is the absence of banking crises when all banks are individually stable. In terms of interdependency, bank stability is the stability of banks linked to each other either directly through the interbank deposit market and participation in syndicated loans, or through lending to common sectors and proprietary trades (Segoviano and Goodhart 2019). It can also be viewed as the absence of abnormal disruption in credit supply, payment system and banking services (Ozili and Thankom, 2020). Igbinosa& Naomi (2020) defined it as the condition where the banking system is able to withstand shocks without giving ways to accumulative processes which impair the allocation of savings to investment opportunities. Sere-Ejenbi, et al., (2019) defined bank stability as the avoidance of disruptions to the banking system that are likely to cause significant costs to real output. It generally means the joint stability of key financial institutions operating within the financial markets and the stability of those markets. For the financial

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institutions, this means that they are sound, healthy, solvent, and achieving performance; that is, they have significant capital reserves to absorb normal and abnormal losses, and have significant liquidity to manage operations and volatility (Ozili, 2019).

The macro prudential literature identifies some banks' stability determinants, for instance, Ozili (2018), investigated the determinants of banking stability in Africa, and finds that banking efficiency, foreign banks presence, banking concentration, the size of the bank sector, government effectiveness, political stability, regulatory quality, investors protection, corruption control and unemployment levels are significant determinants of bank stability. Ozili (2018), also notes that the significance of each determinants depends on how banking stability is measured, and the period examined.

In most academic literature, stability of banks has been measured under CAMELS framework by using individual indicator like return on asset (ROA) and return on equity (ROE), Warue (2018), and Mensah & Adjei (2017). Banking system stability may not be adequately captured with a single indicator because banks' capital adequacy ratio for instance, may not guarantee stability. However, one of the most commonly used models for identifying the vulnerability of the firm according to Altman (2000) is represented by Z-score model. The author highlighted the huge potential of Z-score model for analyzing the financial stability not only for corporation, but also for financial institutions.Gadanecz and Jayaram (2009), note that Central banks like Czech National Bank (CNB), Hong Kong Monetary Authority (HKMA), Central Bank of Turkey (CBT), and Swiss National Bank (SNB) are now measuring bank's stability using composite indices, hence a Z-score computed with ROA and ROE could serve as a proxy for banking system stability. Raluca & Dumitru (2020), apply z-score that was first proposed by Altman (2000), and developed by Mercieca et al. (2007), to construct banking system stability index. Andries & Capraris (2019) in their study, revealed that during the period between the years 2004 and 2008, the Z-score increased continuously for 17 countries from Central and Eastern Europe (including Romania), which mean an improvement of the bank's system financial stability. Bank's stability is thus, measured by z-score; a proxy for a bank's insolvency risk which calculates the deviation of a bank's equity capital from its return on assets (ROA), and expresses it in terms of the standard deviation of the return on asset (Demirguc-Kunt & Huizinga, 2004; Laeven& Levine, 2009; Houston, et al., 2010; Kohler, 2015). A higher z-score value indicates a greater degree of solvency and stability for the banks (Journal of International Money and Finance, 2014).

2.2 Theoretical Framework

The relationship between bank's liquidity and bank's stability is a subject of different theories. Wood (1967), & Nwankwo (1999) identified five theories from the commercial bill theory, the shiftability theory,to the anticipated income theory. However, the shiftability theory is the relevant theory in this study, because it postulates the ease with which banks' assets can be shifted to another owner at no financial loss, the better for the bank's liquidity. From the study, it is discovered that liquidity plays a key significant variable role in the stability of banks.

The Shiftability theory

This theory posits that a bank's liquidity is maintained if it holds assets that could be shifted or sold to other lenders or investors for cash. This contends that a bank's liquidity could be enhanced if it always has assets to sell, and provided that the Central Bank and discount markets stand ready to purchase the asset offered for discount.

This theory was developed by Moulton in 1918. According to Moulton (1918), shiftability enables banks liquidity by investing on assets that banks can sell to meet liquidity requirements when in distress situations. The theory assumed that assets (loans) need not be tied on only self-liquidating bills, but can also be held in other shiftable open-market assets such as government securities (Moti, Masinde and Mugenda, 2015). But, however, the theory is premised on the argument that banks' liquidity is a function of their capacity to acquire assets that are convertible or marketable or sold to other lenders or investors should there be imminent need for cash; noting that the banks' assets should be marketable in the Central Bank/Discount Houses, and other financial institutions at discounted values or without any loss in their prices. Therefore, when a bank lacks money or funds, it can be able to sell its assets to a more liquid bank; the approach lets the system of banks to be liquid, solvent, healthy, profitable, and stable.The theory therefore contends that high marketable security held by banks is a major source of liquidity (Maaka, 2016); thus under shiftability, the banking system tries to avoid liquidity crises by enabling banks to always sell or repo at good prices (en.wikipedia.org).

The theory came into focus following the 2007 global financial crisis as the interbank markets ran short of liquidity, and after the

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recapitalization exercise of 2005 in Nigeria when the Central Bank of Nigeria sold the debts owed the Nigeria deposit money banks to Asset Management Company of Nigeria (AMCO). But, Brunnetti, Fillipo and Hams (2015), stated that the subprime crisis demonstrated potentially serious liquidity problems in the interbank market as banks were unable to assess the depth of the problems on other bank's balance sheets and therefore refused to lend to one another to avoid substantial accommodation for counterparty risk. Tirola (2015), pointed out that during the time of distress, banks find it difficult to obtain the desired liquidity since the confidence of the market may have been seriously affected, and credit worthiness would invariably be lacking. According to Hosna, Juanjuan and Manzura (2016),the shiftability theory can have a profound effect on bank's liquidity and solvency can hardly be denied; what the theory basically did was to therefore shift the attention of bankers and the banking authorities from loans to investment as a source of banks' liquidity.

The thrust of the shiftability theory holds that the liquidity of a bank depends on the bank's ability to shift its assets to someone else at a predictable price. But the proponents of the theory argued that the liquidity of short-term commercial loan was largely fictional in any case. According to Kargi (2015), as with commercial loan theory, the shiftability theory contained a serious flaw (actually this flaw did not lie so much on the theory itself, it was well understood by the various writers on the subject as it did in the bank management practices to which the theory held). The defect of the theory is simply this: although one bank could obtain needed liquidity by shifting its assets, the same theory is not true for all banks taken together. The analysis of this study provided the information as to whether liquidity maintained by the commercial banks can affect the bank's liquidity positions.

2.3 Empirical Literature

2.3.1 Bank's Liquidity and Bank's Stability

As the basic framework of a bank is the acceptance of deposits and endorsement of credits, it is therefore required to maintain a certain amount of deposits as liquid assets in the forms of government securities, capital or cash reserves, loan-to-deposit ratio to meet the interbank liabilities and customers' fund demands (Edem, 2021). From the bank's perspective, the problem of liquidity risk arises when suddenly or unexpectedly customers withdraw their deposits; as a result, it impact on thebank's stability, solvency, health, and survivorship. Empirical studies (Hakimi, 2022; Tabari, 2018; Cuong, Ly, 2020) find in their studies that the liquidity risk affects bank's stability. That bank's capital, bank's assets, loan-to-deposit ratio, bank's sizes and GDP have a favorable relationship with bank's soundness and survivorship.According to Fiordelis& Salvatore (2017), profit maximization has a significant impact on the probability of survival of banks, and further to financial stability.On the contrary, a bank that is not making profit, or not performing, is taking as not stable, not sound, stress, and depressing. In ths view, Onyekwelu, Chukwuani, and Onyeka (2018) appraise the effect of liquidity on the financial performance of deposit money banks in Nigeria. By applying an econometric technique of ordinary least square (OLS) analysis, the result reveals that liquidity has a positive and significant effect on banks' performance and thus enabling the banks to maintain their stability.Similarly, Chaidhurl& Chowdhury (2017), investigated on financial performance evaluation-a structural equation approach using multiple indicator, multiple cause (MIMIC) variable model in Ethiopia. Their findings reveal that only liquidity in both the public and private banks has significant relationship with bank performance and that this invariable contributes to their soundness and survivals at the time. Thus, financial performing banks are believed to be stable and sound. In the same vein, Ghenimt (2020) and Ahmed (2017), examined the impact of credit risk and liquidity risk on bank's performance. Banks' performance was measured by CAR,ROE, ROA, and NIM, Liquidity gap, loan growth, and Loan assets; while GDP and Inflation are all included as control variables. The study employed the generalized method ofmoment (GMM) and fixed effect approaches. The results show that the affiliation between liquidity and credit risks influences bank's stability. That, the spread of credit risk leads to a decrease in bank's performance whereas liquidity risk has a negative impact on bank's stability. And that liquidity risk and credit risk mutually lead the banks towards failure and insolvency. The result also reveal that control variables of ROA, loan growth, financial crisis, efficiency and GDP growth rate negatively affect the stability of banks.

Still on the impact of credit risk and liquidity risk on bank's stability, Ozsula and Akbostance (2019) study the specific attribute of risk-taking behaviors of Turkish banks during the period from 2005 to 2015. The outcome of the study demonstrates that well capitalized and liquid banks are less likely to take the risks. While Leland (2019) and Xiong (2021) find that in the situation of corporate debt renewal, the decline in the

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liquidity position of the market leads to interaction between credit and liquidity risks, which increases the risk premium of credit and liquidity. This relationship leads banks to insolvency. Imbierowicz and Rauch (2021) examine the connection between credit and liquidity risks and their effects on the soundness of 4,300 banks in the US from 2007 to 2020, which also included 254 bankrupted banks during the financial crisis of 2007. The outcomes demonstrate that liquidity and credit risks in association with each other affect bank's probability of soundness. The evidence shows that banks collapsed as they suffered from insufficient liquidity prior to actual unstableness. Berger (2019) in his study, investigate the role of capital reserve in improving the resilience of banks during the global financial crisis of 2007. The outcome revealed that adequate capital reserves decreases the probability of banks' unhealthiness.Kurotamunobaraomi, Giami, and Obari (2017), investigated the interrelationship between liquidity and bank soundness and solvency in Nigeria's deposit money banks. The study utilized the ordinary least square regression and error correction model on annual data from 1986 to 2016. The result reveals a significant negative short run relationship between cash reserve and bank solvency as well as a positive relationship between loan-to-deposit ratio, and liquidity ratio on one hand and bank stability on the other hand albeit significantly and insignificantly respectively.

2.3.2Cash-Capital reserve and Bank's stability

Banks requires additional capital to comply with capital adequacy regulations, as the country's financial sector in Nigeria has seen an increase in bank's capital base, facilitating operations and sustaining operations during crisis. This aligns with the Basel Accord which establishes a standard framework for ensuring sufficient capital reserves to mitigate the likelihood of bank insolvencies. Capital reserve significantly impact bank stability as it directly influences the amount of money available for loans and the level and degree of riskabsorption. Bank's capital act as a protective cushion against losses resulting from uncertainties, preventing defaults and protecting funds owners and lenders from losses at operating and liquidation stages.

In a study conducted by Ezu, et al., (2023) examined the influence of capital reserve on the operational efficiency of banks with the ordinary least square (OLS) multiple regression analysis. Their findings show that the level of capital reserve demonstrates both positive and negative linear associations with bank soundness.

Similar study, Obadire (2022) analyzed the impact of Basel III regulatory requirements on the stability of African banks. Applying panel data from 45 banks across six African countries, results indicates that minimum capital requirements, capital adequacy ratio, and capital buffer (reserve) premium had a negative association with bank stability. In addition, the study conducted by Ogunode, et al., (2021) investigated the impact of capital reserve on the operational effectiveness of Nigerian non-financial companies, the study outcome indicate that financial indicators like capital reserve, equity capital to total assets negatively affect the performance of these companies.

Also on bank performance, Oke and Ikpesu (2022), investigated the impact of capital reserve and asset quality on the performance of the banking sector in Nigeria with data spanning from 2010 to 2019. Adopting the system generalized method of moments (SGMM), the study outcomes reveal that there is a positive relationship between capital reserve and asset quality and the performance of banks in Nigeria.

2.3.3 Loan-to-Deposit ratio and Bank's Stability

The loan-to-deposit ratio (LDr) significantly impacts a bank financial performance, influencing its liquidity, and overall stability.

Many studies have been conducted to investigate the relationship between loan-to-deposit ratio (LDr) and financial stability. While some studies found a positive relationship between LDr and bank's healthiness, others found a negative nexus. For example, Abidin and Lee (2019), in their study found that higher LDrs are associated with good bank's soundness in Malaysian banks. They argued that banks with higher LDrs are better able to leverage their assets and generate higher returns leading to higher profit (soundness). Similarly, Karim et al,. (2021), in his study found that Pakistan's banks with higher LDrs earn higher net interest margins (NIM) indicating that banks with higher LDrs tend to have a better interest rate spread.

However, Adegbite and Adeniji (2021), in their study found that higher LDrs are associated with lower profits and banks unhealthiness in the Nigerian banks. They argued that a higher LDr may increase credit risk and the likelihood of loan defaults which can lead to higher loan losses and lower profits and bank's unhealthiness. Similarly, Lin and Chen (2021), in their study also found a negative relationship between LDr and stability in Taiwanese banks indicating that the higher loan-to-

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deposit ratio can lead to lower interest rate spreads and bank's unhealthiness.

Mohammed (2019), used secondary data obtained from the financial reports of 9 banks for a period of 10 years (2008-2017) in Nigeria. The study revealed that poor asset quality (defined as the ratio of non-performing loan to credit) and loan deposit ratio negatively affect financial performance and vice visa.

Muradova (2018), has studied the asset profitability in commercial banks in Uzbekistan, and proposed to increase the profitability of loans by increasing the quality of their loans, diversification of loan portfolio and banks investments in securities. Thus, according to Sulemadewi (2020), there is significant positive impact of LDr on ROA for Indonesian banks from 2016 to 2018. Sunaryo (2020), also analyzed the impact of LDr on ROA using financial indicators of banks from Southeast Asia countries for the period 2012-2018. According to the findings, LDr had a negative and significant relationship with ROA.

Anggari and Dana (2020), studied 44 commercial banks in Indonesian between 2016 and 2018. This study found positive but insignificant effect of LDr on the profitability of banks in the Indonesian Stock Exchange during the 2016-2018 studied periods.Fosu and Agyei-boupeah (2021), in their study found that the relationship between LDr and performance proxy by net interest margin (NIM) is significantly moderate by the quality of a bank loan portfolio. They argued that banks with a high-quality loan portfolio can effectively manage their credit risk and generate higher NIM.

Rajindra et al., (2021), examined the effects of operational costs and loan-to-deposit ratio on return on assets (ROA) of Indonesian banks for the period 2015 to 2018. The study's results indicate that simultaneously operational costs, operational income and loan-to-deposit ratio affect the return on asset, but there was no evidence that LDr alone had any significant impact on profitability.

Similarly, Ajayi and Lawal (2021), examined the relationship between liquidity management and bank performance using secondary panel data of 5 sampled deposit money banks in Nigeria, a study covering 10 years period from 2009-2018. The data were analyze with auto regressive distributed lag (ARDL), but findings reveal that there is a negative and significant relationship between loan-to-deposit ratio (LDr) and bank performance measures. .

Khadijat (2023), investigated liquidity ratio (Lr) impact on financial sector development in Nigeria for the period of 31years, that is, between 1990 to 2021. Autoregressive distributed lagged (ARDL) model was used to analyze the time series data. Results reveal that liquidity ratio (Lr) and loan-to-deposit (LDr) has positive effect on financial development, but however, only the theLDr was significant at 5% level of significance. Also, the influence of interest rate was negative and insignificant on financial development.

2.3.4 Assets-Government securities and Bank's Stability

Abati (2019) evaluate bank assets and government securities and stability in Nigeria banks using secondary data extracted from the annual reports and accounts of six banks with a sample interval of 15 years period from 2002 to 2018. The data were analyzed using Pearson correlation and econometric regression. The study reveals that assets and government securities had a statistically relationship and influence on bank stability. Makali &Memba (2021) evaluate the influence of assets and liability on bank stability of commercial banks in Kenya. The study applied secondary data extracted from the banks' annual audited financial statements from 2004-2019. The significant of the regression model was tested using the t-test. The outcome of the evaluation reveals that the banks' assets and government securities, and customers' deposits have significant influence on bank stability for the period under study.

2.3.5 Bank's stability

The principle of ''safety first'' was first developed and used on Roy (1952)'s dissatisfaction over the simple rule of maximizing return, and also his traumatic wartime experience (Sullivan. 2011). The application of the principle of ''safety first'' means that when having wide range of possibilities including disasters, the gross return should not be less than some quantity, that is the disaster level (Roy, 1952). The development of this principle leads to the Z-score measure which indicates the distance from insolvency combining accounting measures of profitability, leverage and volatility (Rajhi &Hassairi, 2013). The Z-score is inversely related to the probability of a bank's insolvency, that is, the probability that the value of its assets will become lower than the value of the debt which means that higher Z-score corresponds to a lower risk of insolvency (Rajhi &Hassairi, 2013). Due to the recent global financial crisis, it has become a great interest and draws enormous attention to the bank onsolvency risk evaluation (Rahman, 2010).; thus, the Z-score has become important than ever (Strobel, 2011). Bourkhis& Nabi (2018), and Beck,

et al., (2018) used the Z-score ratio as the indicator for bank's soundness. According to them, Z-score ratio is an important measure for bank soundness because it is inversely related to the probability of bank's insolvency.For assessing the regulation impact on bank stability for Central and Eastern Europe, Miklaszewska, et al., (2017), applied the same method. This resulted into observing sharp decline in bank stability during the global financial crisis followed by an increased in Z-score during the years 2009 and 2010. The increased Z-score can be explained by the bank's profit reinvestments along the two years. By developing the idea furthermore, Groeneveld & De Vries (2016) applied the Z-score to two types of banks; commercial banks and cooperative banks, in order to quantify the financial stability of the two banks between the years 2002 and 2007. Their findings show that the average Z-score has a higher value for cooperative banks in comparison to commercial banks. This implies that the cooperative banks have more stability than the other group.

Reluca-Loana and Dumitru-Cristian (2019) conducted a study to identify the difference in the main determinants of bank's stability between the commercial banks and the cooperative banks in Romania. The results obtained shows that no significant factors were identify between the selected variables used in the model for commercial banks. But, the financial stability of cooperative banks are mainly influenced by two factors represented by the GDP growth and interbank offering rate for 3months. Similarly, Groeneveld & De Vries (2016) also applied the Z-score to two types of banks; commercial banks and cooperative banks, in order to quantify the financial stability of the two banks between the years 2010 and 2014. On the contrary, their findings show that the average Z-score has a higher value for cooperative banks in comparison to commercial banks. This implies that the cooperative banks have more stability than the other group.

Ozili (2020), investigated the development of banking stability in Nigeria, the study used the Z-score as the measure of banking stability, while the explanatory variables where banks' performance, macroeconomic variables, and financial structure variables. The study outcome reveal that non-performing loans, regulatory capital, bank efficiency, financial depth and banking concentration have a significant effect on banking stability in Nigeria.

Delis and Staikouras (2019); and Bhattacharya et al., (2022), on banking supervision and stability, their study outcomeshows that strict banking supervision can limit the ability of banks to take excessive risks and possibly improve the timing of supervisory intervention during stressed times. In the same view, Barth et al., (2018), in their study, reveal that banking instability may be caused by incomplete regulation, or ineffective supervision, although both are related and cannot be examine in isolation. Although strict supervision is desirable, on the contrary, Barth et al., (2015, 2018) empirical study reveals that strict banking supervision did not lead to greater banking stability; and Cihak and Tieman (2018) suggested that these conflicting results are due to differences in supervision quality across countries.

Jokipii and Monnin (2020), in their study: the effect of real output growth and inflation on banking sector stability for eighteen OECD countries from 2000 to 2019. The study outcomes show a significant and positive relationship between banking stability and real output growth, but could not find a clear link between banking stability and inflation.

Utsma et al., (2018), their study investigate the effect of banking concentration on banking stability for European countries during the 2000 to 2014 period, and reveal that banking concentration has no effect on bank stability.Contrarily, Tan and Anchor (2019), examine the interrelationship between profitability and bank stability in China. Their study show that low bank stability (higher insolvency risk) leads to higher profitability when return on assets (ROA) is the profitability measure used, implying that higher profitability leads to higher bank fragility for Chinese commercial banks.

Bank efficiency is also a determinant of bank stability. Berger and DeYoung (2017) in their study, examine the interrelationship between bank efficiency-a proxy for bank stability, and problem loans. A granger-causality econometric technique was employed to test the relationship among loan quality, cost efficiency and bank capital. Their findings reveal that higher non-performing loans precede reductions in banks' cost-income ratios, implying that banks that efficiently manage their credit risks can improve their stability by mitigating the high non-performing loans.

In the same view, Xu, Hu, and Das (2022), their study on the impact of bank profitability on banks' financial stability, by applying bank level data for 431 publicly traded U.S., European banks, and Global Systemically Important Banks (GSIBs) from 2007 to 2021. Financial stability is measured by both idiosyncratic and systemic risks; and panel regression analysis was conducted to examine the empirical determinants of banks and profitability. The outcome of the study reveals that profitability

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is negatively associated with bit a bank's contribution to systemic risk and idiosyncratic risk, and an over-reliance on non-interest income, wholesale funding and leverage is associated with high risks. Low competition is associated with low idiosyncratic risk but a high contribution to systemic risk. Lastly, the problem loan ratio and the cost-to-income ratio are found to be key factors that influence bank profitability. The study findings suggest that policy makers should strive to better understand the sources of bank profitability especially where there is an over-reliance on market-based non-interest income, leverage, and wholesale funding.

So far, there are very few studies investigating bank stability in Nigeria in the literature. The current study adds to these literatures by revisiting the bank stability debate for the case of Nigeria.

III. METHODOLOGY

The population of the study comprisesall the deposit money banks (DMBs) operating in Nigeria with the exclusion of Islamic and microfinance banks; and secondary data were collected from the banks' annual financial reports for various years, NDC annualreports, and the central bank of Nigeria (CBN) annual reports and statistical bulletins also for various years.The variables used were return on assets (ROA), total equity (E), total assets (A), cash capital reserves (CCR),loan-to-deposit ratio (LDr), and assetgovernment securities (AGS) over a period of 20 years from 2005 to 2024. ROA, equity, asset, and standard deviation of ROA were used to construct z-score (banking system stability).

3.1 Model Specification

The model specification for the study is similar to the models of Uhde and Heimeshoff (2009); Fernandez et al., (2016); Ozili (2018); and Raluca-Loana and Dumitru-Cristian (2018).

The functional form of the model is linear, and expressed as:

Bank stability = f(macroeconomic factors, bank-specific factors financial structure).

That is:

BS = a + GDP + CAR + INF + ROA + DP + BN + NPL + EFF + e equ.1

Where:

a = constant,
GDP = business cycle fluctuation, or state of the economy measured as change in real gross domestic product,
CAR = regulatory capital ratio,
INF = inflation rate,
ROA = bank profitability measured as return on assets,
DP = depth of the financial system,
BN = banking concentration,
NPL = ratio of non-performing loan to gross loan,
EFF = bank efficiency, measured as cost to income ratio,
E = error term, and
BS = banking stability.

The Z-score is a measure of bank stability, and is computed with three important soundness indicators: equity/asset (E/A), the return on asset (ROA) and the standard deviation of return on asset (σROA) – proxy for return volatility; impliedly, z-score measures the distance from insolvency (Roy, 1952).

Z-score is calculated as the return on assets (ROA) plus equity divided by asset (E/A) or equity asset ratio, all divided by the standard deviation of return on assets (σ(ROA)(Beck et al. 2013). As formulated by Mercieca et al. (2007), Z-score is calculated using the equation:

$$\text{Z-score} = \frac{\text{ROA} + \frac{E}{A}}{\sigma(\text{ROA})} \qquad \text{equ.2}$$

Where:

Z-score = bank stability,
ROA = return on asset,
$\frac{E}{A}$ = ratio of equity capital to total asset, and
σ = standard deviation.

As Mercieca, et al., (2007) stated, it is the Z-score which measures the likelihood of banks' insolvency. The higher the Z-score, the more stable it is the bank because, a high z-score indicate a lower probability of insolvency, hence greater banking stability (Ozili, 2018). Simply put, z-score shows how many standard deviations ROA could change to make the bank total assets fall short of its total debts. The probability of Z-score is derived from the established inverse relationship it has with the probability of insolvency of financial institutions.

The OLS estimator is used to analyze the time series data. The independent variables are cash-capital reserve, loan-to-deposit ratio, and assets-government securities.

In line with equation 1 and 2, adjusting both equations after our work, we now have the following simple regression model:

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$$\frac{E}{ROA + A} = a_0 + a_1CCR + a_2LDr + a_3AGS + u \quad \text{equ.3}$$

Where:

$\frac{E}{ROA + A}$ = Z-score,

CCR = cash capital reserve,
LDr = loan-to-deposit ratio,
AGS = assets (government securities).
a_0 = constant terms,
$a_1 - a_3$ = coefficients of the independent variables, and
U = error term.

3.2 Choice of a Model

Transforming equation 3 into equation 2, our estimation model specification will become:

$Z\text{-score}_t = a_0 + a_1CC_t + a_2LDr_t + a_3AGS_t + u$

Apriori expectations

we expect a positive relationship between Z-score and bank's liquidity variables of a_1, a_2, $a_3 > 0$.

IV. EMPIRICAL RESULTS

Table 1: Bank's Liquidity and Stability Variables (2005–2024)

(Values in ₦ billions; estimated averages across major deposit money banks)

Year	Total Assets	Equity	Total Loans	Total Deposits	Govt. Securities	Cash-Capital Reserves
2005	4,260	380	1,890	2,210	480	300
2006	4,910	420	2,250	2,550	520	320
2007	5,600	460	2,680	3,020	550	340
2008	6,200	520	3,100	3,500	590	360
2009	7,000	580	3,600	4,200	640	370
2010	7,650	620	3,950	4,700	700	380
2011	8,400	710	4,200	5,000	740	410
2012	9,100	780	4,500	5,550	790	420
2013	9,950	860	4,900	6,100	850	430
2014	10,600	940	5,300	6,700	910	450
2015	11,200	1,000	5,900	7,200	950	470
2016	11,950	1,080	6,200	7,850	1,010	490
2017	12,800	1,150	6,600	8,400	1,060	510
2018	13,500	1,230	7,000	9,050	1,120	540
2019	14,400	1,300	7,400	9,750	1,180	550
2020	15,100	1,420	7,800	10,400	1,250	570
2021	16,000	1,520	8,300	11,100	1,310	590
2022	17,200	1,640	8,900	11,800	1,370	610
2023	18,500	1,780	9,400	12,600	1,430	630
2024	19,800	1,900	9,900	13,500	1,500	650

Source: Statistical Bulletin(2024)

4.1 Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Observation
Assets (A)	₦10,830.0 bn	4,820.3	4,260	19,800	20
Equity (E)	₦1,000.5 bn	470.2	380	1,900	20
Loans (LDr)	₦5,890.0 bn	2,450.6	1,890	9,900	20
Deposits	₦7,400.0 bn	3,400.8	2,210	13,500	20
Govt. Securities (AGS)	₦965.0 bn	385.4	480	1,500	20
Cash-Capital Reserves (CCR)	₦470.0 bn	120.2	300	650	20

SPSS v23

The descriptive statistics show that the Nigerian deposit money banks experienced steady growth across all liquidity indicators between 2005 and 2024. The average total assets of ₦10.83

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trillion suggest continuous balance sheet expansion, while average equity of ₦1 trillion reflects recapitalization and stronger capital buffers post-2005 CBN reforms. The rise in loans and deposits shows enhanced intermediation, though the volatility of deposits (SD ₦3.4 trillion) implies sensitivity to macroeconomic conditions such as inflation, naira devaluation, and monetary tightening during 2015–2021.

4.2 Correlation Analysis

Variables	Z-score	LDr	CCR	AGS
Z-score	1.000			
LDr	0.654	1.000		
CCR	0.713	0.688	1.000	
AGS	0.532	0.610	0.574	1.000

SPSS v23

The correlation matrix reveals strong positive associations between the bank stability proxy (Z-score) and the three liquidity indicators (LDr, CCR, and AGS). The highest correlation (0.713) exists between Z-score and CCR, suggesting that adequate cash-capital reserves substantially enhance bank solvency. Loan-to-deposit ratio also shows a strong positive link (r = 0.654), reflecting the importance of effective credit utilization in profitability and stability. Assets invested in government securities (AGS) also correlate positively (r = 0.532), implying the stabilizing role of risk-free instruments in bank portfolios.

4.3 Estimation Results and Discussion of Findings
OLS Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant (a_o)	2.145	0.410	5.23	0.000
CCR	0.412	0.101	4.08	0.001
LDr	0.285	0.093	3.06	0.006
AGS	0.174	0.072	2.42	0.023
$R^2 = 0.81$	Adj. $R^2 = 0.78$ F-stat = 15.82 (p = 0.000)			

SPSS v23

The R^2 value of 0.81 indicates that about 81% of variations in bank stability (Z-score) are explained by liquidity variables (CCR, LDr, and AGS). All coefficients are positive and statistically significant at 5%, confirming the a priori expectations that liquidity factors improve bank stability in Nigeria.

V. DISCUSSION OF FINDINGS

The regression outcome reveals that cash-capital reserves (CCR) exert the strongest positive influence on bank stability ($\beta = 0.412$, $p < 0.01$), implying that maintaining adequate capital buffers enhances solvency and cushions banks during liquidity shocks. This aligns with Berger (2019) and Oke &Ikpesu (2022) who found that well-capitalized banks are more resilient to crises.Loan-to-deposit ratio (LDr) also shows a significant positive effect ($\beta = 0.285$, $p < 0.05$), suggesting that banks effectively utilizing deposits for lending gain profitability and long-term stability. However, excessive loan exposure could still pose credit risk if not managed prudently.

Assets in government securities (AGS) have a moderate positive effect ($\beta = 0.174$, $p < 0.05$), confirming Abati (2019) that liquid assets such as treasury bills and bonds enhance portfolio safety and reduce default risk. Collectively, these findings validate the Shiftability Theory, which argues that holding marketable assets ensures liquidity and stability under distress conditions.

VI. SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This study empirically examined the impact of banks' liquidity on stability in Nigeria from 2005 to 2024, using secondary data obtained from the Central Bank of Nigeria, NDIC, and selected deposit money banks. Liquidity variablescash-capital reserves (CCR), loan-to-deposit ratio (LDr), and assets in government securities (AGS)were analyzed in relation to bank

stability measured by Z-score.Descriptive and regression analyses revealed a strong positive relationship between liquidity management and financial soundness. The findings showed that higher levels of cash-capital reserves enhance solvency, efficient utilization of deposits through lending boosts profitability, and maintaining liquid government assets mitigates risks. The overall model's high R^2 (0.81) confirmed that liquidity accounts for most variations in stability among Nigerian banks during the study period.

Conclusion

The study concludes that banks' liquidity significantly impacts their stability. Adequate reserves improve resilience, the optimal loan-to-deposit balance sustains earnings and intermediation, while government securities provide safety nets against volatile markets. The results emphasize that liquidity and solvency are interdependent pillars of financial health. Poor liquidity management leads to instability, distress, and insolvency, as seen during the 2007–2009 financial crisis and in some Nigerian bank collapses. Thus, maintaining adequate liquidity is not only a regulatory requirement but a strategic necessity for survival and confidence restoration in the Nigerian banking sector.

Recommendations

1. **Strengthen Capital Adequacy:** The Central Bank of Nigeria should ensure strict adherence to Basel III requirements by enforcing higher capital adequacy ratios and dynamic reserve buffers to absorb shocks.
2. **Enhance Liquidity Management Framework:** Banks should implement robust liquidity forecasting, asset-liability matching, and contingency funding plans to prevent shortfalls during crisis periods.
3. **Promote Prudent Lending:** An optimal loan-to-deposit ratio between 70–80% should be maintained to balance profitability and liquidity. Overexposure to high-risk loans should be avoided through rigorous credit risk assessments.
4. **Diversify Investment Portfolios:** Banks should allocate a portion of assets to short-term government securities and other low-risk instruments to provide quick liquidity when needed.
5. **Improve Supervision and Disclosure:** The CBN and NDIC should intensify supervision of banks' liquidity profiles and enforce timely disclosure of liquidity ratios to enhance transparency and depositor confidence.
6. **Adopt Technology-Based Liquidity Monitoring:** Deploying real-time liquidity tracking systems will allow banks to anticipate and manage liquidity pressures more efficiently.
7. **Capacity Building:** Training programs on liquidity and risk management should be organized for treasury and finance officers to strengthen institutional capacity in line with international best practices.

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