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# IMPACT OF REGULATORY LIQUIDITY REFORMS ON FINANCIAL SYSTEM STABILITY IN NIGERIA AFTER THE GLOBAL FINANCIAL CRISIS

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## ABSTRACT

This paper examines the impact of liquidity reforms on financial system stability in Nigeria in the aftermath of the 2007/2008 global financial crisis. The crisis exposed significant vulnerabilities within the global financial system, prompting regulatory bodies to adopt measures including the introduction of the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) to strengthen the resilience of financial institutions and mitigate systemic risks. Using a Regression Discontinuity Design (RDD), the study analyzes panel data from 14 banks

## Introduction

The 2007/2008 global financial crisis (GFC) was a watershed moment that exposed profound vulnerabilities in the global financial architecture, particularly in liquidity management and regulatory oversight (Global Financial Stability Report, 2010; Borio, Farag, & Tarashev, 2020). The crisis, triggered by the collapse of major financial institutions and the contagion effects of the subprime mortgage market in the United States, rapidly



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operating in Nigeria over the period 2010 to 2021. The results indicate that both LCR and NSFR significantly and positively influence financial system stability. Specifically, higher compliance with the LCR is associated with improved short-term liquidity risk management, while adherence to the NSFR contributes to greater long-term financial resilience. These findings suggest that the reforms have not only enhanced individual bank solvency but also mitigated systemic risks by reducing the likelihood of liquidity-induced disruptions. The paper contributes to the growing body of literature on post-crisis regulatory reforms by providing empirical evidence from Nigeria, emphasizing the relevance of global liquidity standards in safeguarding financial systems in developing markets. It underscores the need for sustained regulatory oversight and compliance with international liquidity standards to maintain stability and foster trust in the banking sector. The findings have important implications for policymakers and financial regulators. They emphasize the need for continued enforcement of liquidity requirements and suggest that further refinements to the regulatory framework could yield additional stability benefits. This study demonstrates that liquidity reforms, specifically the implementation of LCR and NSFR, have been instrumental in strengthening financial system stability in Nigeria.

**Keywords:** Liquidity coverage ratio, net stable funding ratio, financial system stability.

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Escalated into a global economic downturn (Committee on the Global Financial System, 2018). Its ramifications were felt across economies, irrespective of their level of development. Financial institutions worldwide grappled with severe liquidity shortages during the crisis, causing widespread bank failures and economic contractions. Financial markets were characterized by widespread uncertainty, severe liquidity crunches, and a loss of confidence in the stability of financial institutions. Prior to the crisis, many financial institutions relied excessively on short-term wholesale funding, leaving them vulnerable to sudden liquidity freezes.

The crisis underscored the critical need for robust regulatory frameworks to mitigate systemic risks and safeguard financial stability. Financial system stability refers to the ability of the banking sector to absorb shocks, function effectively, and contribute to economic growth without triggering systemic crises. Against this backdrop, policymakers and regulatory bodies around the world embarked on a comprehensive overhaul of financial regulations to enhance the resilience of banking systems and mitigate future systemic risks. In response to the GFC, global financial regulators, led by the Basel Committee on Banking Supervision (BCBS), introduced a series of regulatory reforms under the Basel III framework in 2010, which represented a paradigm shift in global banking regulation (BCBS, 2010; BCBS, 2022). Among these reforms, the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) were introduced to address liquidity and funding mismatches, which were primary drivers of the crisis. These measures aimed to ensure that banks maintained sufficient high-quality liquid assets to survive short-term shocks and established stable funding profiles to address long-term liquidity mismatches. The main goal was to strengthen the financial system's ability to absorb shocks and reduce the likelihood of taxpayer-funded bailouts during crises.

Although Nigeria was not at the epicenter of the crisis, its financial system exhibited systemic weaknesses that underscored the need for reform. Nigerian banks experienced heightened liquidity challenges, deteriorating asset quality, and increased systemic risks during the crisis period (Sanusi, 2010). These issues were compounded by structural factors such as inadequate liquidity buffers, heavy reliance on short-term deposits, volatile interbank markets, and limited access to long-term funding sources. The Central Bank of Nigeria (CBN) responded with a series of interventions, including liquidity support measures, capital injections, and reforms aimed at stabilizing the banking sector (CBN, 2011). Recognizing the global shift towards more robust regulatory frameworks, the CBN also sought to align its regulatory practices with international standards by adopting components of

the Basel III framework, particularly the liquidity reforms. The adoption of regulatory liquidity reforms in Nigeria has been a gradual and multifaceted process. The CBN introduced the LCR and NSFR in 2021 as part of its broader efforts to align with international best practices (CBN, 2021). The LCR requires banks to hold sufficient high-quality liquid assets to cover net cash outflows over a 30-day stress scenario, while the NSFR mandates a stable funding profile for longer-term assets and activities. The implementation of these reforms posed significant challenges for Nigerian banks. Meeting the LCR and NSFR requirements necessitated substantial adjustments to asset-liability management practices, increased holdings of liquid assets, and a shift away from reliance on short-term funding.

Financial system stability is vital for economic growth and development, as it ensures efficient financial intermediation and mitigates systemic risks (World Bank, 2016). However, the Nigerian banking sector has historically faced challenges, including liquidity crises, bank failures, and systemic risks, exacerbated by global economic shocks. The introduction of LCR and NSFR aimed to address these vulnerabilities by ensuring banks maintain sufficient high-quality liquid assets and stable funding profiles. Yet, the effectiveness of these regulatory measures in achieving financial system stability in Nigeria remains underexplored. Existing studies predominantly focus on advanced economies, with limited evidence from developing economies like Nigeria. Furthermore, the unique structural and operational characteristics of Nigeria's banking sector, such as high non-performing loan ratios and a significant informal sector, necessitate localized research. This study aims to bridge this gap by focusing on the Nigerian banking sector, analyzing data from 14 banks over the period 2010 to 2021. The scope encompasses the assessment of the LCR and NSFR as regulatory liquidity reforms and their impact on financial stability, measured by Z-scores. Z-scores are a comprehensive measure of systemic risk, capturing the probability of insolvency based on profitability, leverage, and volatility. The study employs

RDD to isolate the causal effects of the LCR and NSFR, leveraging their implementation as a natural experiment.

The findings of this study have significant implications for policymakers, regulators, and financial institutions. By providing empirical evidence on the effectiveness of liquidity reforms, the study offers valuable insights into the role of regulatory interventions in enhancing financial stability. For policymakers, the results will inform the design and implementation of future reforms, balancing the need for robust liquidity frameworks with economic growth and financial inclusion objectives. For financial institutions, the study highlights the practical implications of compliance with liquidity requirements, including challenges and opportunities for optimizing liquidity management practices.

This paper makes several key contributions. First, it provides robust empirical evidence on the effectiveness of LCR and NSFR in enhancing financial stability in a developing economy context, thereby providing context-specific findings that reflect the realities of a developing economy. The study focuses on the Nigerian banking sector, a context that has received limited attention in the global discourse on regulatory liquidity reforms. By examining the period 2010 to 2021, the study captures the long-term effects of these reforms, providing a comprehensive analysis that extends beyond immediate post-implementation outcomes. Second, it advances the methodological frontier by employing RDD, a quasi-experimental design that allows for precise estimation of causal effects, thereby addressing limitations in earlier studies that relied on less rigorous methodologies. Third, the study offers actionable insights for regulators and financial institutions, balancing the goals of stability, competitiveness, and inclusivity in the banking sector. Finally, the study contributes to the global discourse on financial regulation, highlighting the unique challenges and opportunities associated with implementing international standards in emerging markets. By focusing on Nigeria, it provides a nuanced understanding of how regulatory reforms interact with local economic and structural dynamics, offering lessons for other developing

economies. These contributions enhance the relevance and applicability of the findings, addressing critical gaps in the literature and informing policy and practice.

The rest of the paper is organized as follows: Section 2 reviews the underpinning theory (Public Interest Theory) as well as related literature on liquidity requirements and financial stability. Section 3 describes the data and the empirical methodology. Section 4 provides the results obtained and discussion on the empirical findings on the impact of the liquidity measures on financial system stability. Section 5 concludes and discusses policy implications.

## Literature Review and Hypotheses Development

The literature review provides an overview of the theoretical and empirical foundations underpinning this study. At the core of this study is the application of Public Interest Theory (PIT), which posits that regulations, particularly in industries such as banking, are designed to serve the public good by mitigating systemic risks and protecting the economy from financial crises. This paper will explore PIT as the underpinning theory for examining the impact of liquidity ratios on the stability of Nigeria's financial system, detailing how public interest considerations drive the regulation of liquidity requirements.

## Theoretical Review: Public Interest Theory

Public interest theory (PIT) provides a robust framework for understanding regulatory interventions in the banking sector. Public Interest Theory emerged in the late 20th century as a counterpoint to theories that viewed regulation purely from an economic or private interest perspective (such as the Capture Theory). PIT, as articulated by Pigou (1932), suggests that regulation is a tool for addressing market failures, protecting consumers, and ensuring the welfare of society at large. According to PIT, government intervention, through regulation, is necessary to rectify the inefficiencies created by monopolistic or oligopolistic markets, information asymmetry, and other forms of market distortion. In the case of the banking sector, PIT posits

that government intervention is crucial in addressing the systemic risks that arise from the failure of banks and the potential for contagion in the broader financial system.

The financial sector is considered one of the most important sectors in an economy, as its stability affects the functioning of other sectors. When banks fail or face significant financial distress, the repercussions can extend throughout the economy, affecting individuals, businesses, and government operations. As such, the regulation of liquidity in banks has been a central focus of financial stability measures, particularly in the aftermath of the GFC. Public Interest Theory, in the context of banking, suggests that regulatory frameworks such as Basel III's LCR and NSFR are designed to mitigate the risks of bank insolvencies and systemic crises. These regulations ensure that banks maintain sufficient liquid assets to withstand short-term liquidity shocks and have access to stable, long-term funding to avoid overreliance on volatile short-term markets. By focusing on these liquidity ratios, the regulatory body aims to protect public welfare by minimizing the likelihood of bank runs, enhancing market confidence, and preventing financial contagion that could undermine the entire banking system.

Public Interest Theory highlights the regulatory imperative of promoting financial stability to ensure that the broader economy functions efficiently. Liquidity regulations, such as the LCR and NSFR, are essential tools in achieving this goal. By requiring banks to hold sufficient liquid assets and stable funding sources, regulators mitigate the risks of insolvency, protect depositors, and maintain public confidence in the financial system. The introduction of the LCR and NSFR can be seen as a response to the public interest, where the government acts to prevent market failures and protect public welfare. The public interest in a stable and functioning financial system motivates the implementation of these liquidity regulations. The Nigerian financial system, which has faced challenges such as inflation and exchange rate volatility, requires robust regulations to ensure the resilience of its banks. By enforcing the LCR and NSFR, Nigerian regulators aim to enhance the stability of the banking sector, reduce systemic risks, and ultimately protect the public interest. Moreover, PIT provides a rationale for why the

government should intervene in the regulation of banks, particularly during periods of financial distress or instability. The regulation of liquidity in Nigerian banks is not merely to protect individual banks but to preserve the broader public good by reducing the likelihood of systemic crises, safeguarding economic growth, and promoting financial inclusion.

## Empirical Review and Hypotheses Development

Empirical studies on the relationship between liquidity ratios and financial stability have been mixed. Shafik (2014) examined the determinants of banks' financial stability in countries of the Gulf Cooperation Council (GCC) (United Arab Emirates, Saudi Arabia, Oman, Qatar, Kuwait and Bahrain) with specific focus on the impact of bank liquidity on financial stability. The sample consists of annual data from 127 banks (conventional and Islamic banks) in GCC countries for the period 2005 to 2012. The study employed the Generalized Method of Moments (GMM) for the analysis. The results reveal that bank liquidity has a significant positive impact on financial stability. Also, Chiaramonte and Casu (2016) investigated the impact of structural liquidity and capital ratios, as specified by Basel III, on banks' likelihood of failure across the EU-28 member states over the past decade using a large bank-level dataset. The study used pooled logistic regression technique to analyze data from 513 banks located in EU-28 member states with 1,982 bank-year observations for the period 2004-2013. They found that higher liquidity reserves reduce the risk of failure and distress.

Similarly, Bawazir (2018) examined the impact of Net Stable Funding Ratio (NSFR), as described in Basel III, on risk and return for 500 banks in 28 European countries. Annual income statements and balance sheet data were collected from the Fitch-IBCA BankScope (BSC) database for commercial banks in 28 EU countries for the period from 2005-2010. Using a regression discontinuity design analysis, the study investigated whether and to what extent adhering to the NSFR effectively enhances bank stability as well as assessing its impact on bank performance. The results suggested that adherence to the NSFR requirements causes the financial stability of European banks to increase. Vazquez and Federico (2015) looked at the

evolution of bank funding structures in the years leading up to the global financial crisis and the consequences for financial stability. The study used a regression technique to examine a bank-level dataset covering around 11,000 banks in the United States and Europe from 2001 to 2009. The findings reveal that banks with less structural liquidity and higher leverage prior to the crisis were more likely to fail thereafter.

Hlatshwayo, Petersen, Mukuddem-Petersen, and Meniago (2013) examined the impact of Basel III liquidity coverage ratio and net stable funding ratio on bank failure. The study used global liquidity data that consist of observations for LIBOR-based banks for the period 2002 to 2012. Data obtained from 391 banks from 36 countries were analysed using descriptive statistics approach. The findings show that a higher liquidity coverage ratio is associated with a higher bank failure rate. Similarly, Yusgiantoro, Wirdiyanti, and Malinda (2019) carried out a cross-country study to investigate the relationship between regulatory capital, liquidity creation, profitability, and financial stability. Using data collected from a sample of 558 commercial banks across 84 countries over the 2011-2017 time period, the study applied the one-step system GMM dynamic panel estimators of Arellano and Bover (1995) and Blundell and Bond (2000) for the analysis The results reveal that liquidity creation has a negative impact on financial stability.

Amara and Mabrouki (2019) probed the impact of liquidity and credit risks on the stability of Tunisian banks. Data for a 10-year period covering 2006 to 2015 were collected from a sample of 8 commercial banks in Tunisia. The study employed Generalized Method of Moments (GMM) to analyze the relationship between credit risk and liquidity risk and their impact on bank stability. The results reveal liquidity risk does not have a significant impact on bank stability.

Based on the public interest theory and the empirical evidence discussed, the following hypotheses are developed for this study:

Hypothesis 1: Liquidity Coverage Ratio has a positive and significant impact on financial system stability in Nigeria.

- Based on PIT, the LCR is expected to reduce liquidity risk and improve the stability of Nigerian banks. A higher LCR ensures that banks are better

equipped to handle short-term liquidity shocks, reducing the likelihood of insolvency and enhancing financial stability.

Hypothesis 2: Net Stable Funding Ratio has a positive and significant impact on financial system stability in Nigeria.

- The NSFR is expected to mitigate the risk of liquidity mismatches by promoting long-term stability. Banks with higher NSFRs are less reliant on short-term funding, which makes them more resilient to market volatility and systemic crises.

## Data and Methodology

### Data Sources and Sample Selection

The study relies on secondary data obtained from multiple credible sources including annual reports and financial disclosures of the 14 selected banks, covering the period 2010 to 2021 and the Central Bank of Nigeria (CBN)'s publications comprising regulatory guidelines, financial stability reports, and other relevant documents. The data collection process ensures consistency and comparability across banks and years, enabling a robust analysis of the relationship between LCR, NSFR, and financial stability. The study focuses on 14 commercial banks operating in Nigeria, selected based on their systemic importance and data availability. These banks represent a significant portion of the Nigerian banking sector, ensuring that the findings are generalizable to the broader industry. The sample criteria include banks classified as systemically important by the CBN, availability of consistent data on LCR, NSFR, and financial performance for the period 2010 to 2021, and banks that were subject to the implementation of Basel III liquidity measures during the study period. The selected banks include a mix of large and small banks, which helps capture the full spectrum of bank characteristics. The key variables for this study are:

- **Liquidity Coverage Ratio (LCR):** The ratio of a bank's high-quality liquid assets to its total net cash outflows over a 30-day stress period.
- **Net Stable Funding Ratio (NSFR):** The ratio of available stable funding to required stable funding over a one-year period.

- **Z-score:** A measure of financial stability, calculated as the sum of a bank's return on assets (ROA) and its equity-to-assets ratio, divided by the standard deviation of ROA.

## Data Analysis Technique

This study examines the impact of the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) on financial system stability in Nigeria, measured by the Z-score. The analysis employs Regression Discontinuity Design (RDD) to estimate the causal effects of LCR and NSFR on bank stability, utilizing data from 14 banks over the period 2010 to 2021. The choice of RDD stems from its ability to exploit a natural discontinuity in the policy or regulatory environment, providing a robust approach for estimating causal relationships in non-experimental settings. Regression Discontinuity Design (RDD) is a quasi-experimental research design that allows for causal inference in situations where random assignment is not feasible. The key feature of RDD is the presence of a cutoff or threshold that determines which units (in this case, banks) are exposed to a treatment or intervention (the liquidity regulations of LCR and NSFR). Banks that are just above or below the threshold for regulatory compliance are compared to estimate the causal effect of the treatment on the outcome of interest, in this study, the financial stability of Nigerian banks as measured by their Z-scores.

There are two types of RDD: Sharp RDD and Fuzzy RDD (Jacob, Zhu, Somers, & Bloom, 2012). In a sharp design, the treatment assignment is deterministic, meaning that the assignment to treatment or control groups is strictly based on whether the unit exceeds or falls below the cutoff value. In contrast, in a fuzzy design, the assignment to treatment is probabilistic, and there may be some variation in treatment exposure around the cutoff. For this study, sharp RDD was applied, as the regulatory thresholds for LCR and NSFR compliance are clearly defined, and all banks with ratios below the required thresholds will not meet the compliance requirements, while those above the thresholds will. Specifically, the LCR cutoff is set at 100%, meaning banks must hold liquid assets equal to or greater than their net outflows to meet the regulatory requirement. Similarly, the NSFR cutoff is set at 100%, meaning banks must

have stable funding equal to or greater than their required stable funding. Banks that meet these thresholds are considered compliant with the regulations, while those below the threshold are considered non-compliant.

The identification of causal effects in RDD relies on several key assumptions including:

1. **Continuity Assumption**: The potential outcomes (i.e., Z-scores) for banks just above and just below the cutoff for LCR and NSFR are assumed to be continuous. This implies that any discontinuity in the Z-score at the cutoff can be attributed to the treatment effect (compliance with LCR/NSFR regulations). Test for Discontinuity was conducted (see Figure 2)
2. **No Manipulation**: Banks should not be able to manipulate their liquidity ratios in such a way that they can move across the threshold. This assumption ensures that the cutoff is not endogenously determined and that the assignment to treatment (regulation compliance) is as good as random near the threshold. Test for manipulation was conducted (see Figure 1)
3. **Local Randomization**: Banks just above and below the threshold are assumed to be similar in all respects other than their compliance with the LCR and NSFR regulations. This assumption ensures that any observed differences in financial stability (Z-scores) can be attributed to the liquidity regulations.

The analysis was based on an array of assumptions that seek to address the lack of sufficiently detailed publicly available data on the various components of banks' liquidity coverage ratios and net stable funding ratios and attempts to be as realistic as possible, basing most of the assumptions on market evidence and taking into consideration regulatory specificities. Following Bawazir (2018), CBN guidelines on Basel III implementation and a conservative approach, specific LCR and NSFR factors were applied to the assets, liabilities and off-balance-sheet activity to calculate the required and available amounts of stable funding as well as HQLA and cash flows:

a. All loans are assumed to have maturity of more than one year since the breakdown of loans by categories and maturities are not largely available and will be assigned a Required Stable Funding (RSF) of 85%.
b. Fixed assets and non-earning assets (except for cash and due from banks) are assigned an RSF of 100%.
c. For the lack of breakdown of customers deposit into stable and less stable, customers deposit is assigned a 70% Available Stable Funding (ASF) and a run-off rate of 30%.
d. Long-term liabilities and equity are considered to be stable at the one-year time horizon.
e. All government securities are assigned an RSF of 5% while securities in available-for-sale or trading portfolios (equities and corporate bonds) a 50% RSF.

This study controls for a host of bank-specific variables in the regression analysis that may affect financial system stability including bank size, profitability, funding structure, cost-to-income ratio (Efficiency), and loan loss reserve (LLR) which have been used in previous studies. The study includes the natural logarithm of total assets to control for bank size (size). According to Shapiro (2008), large firms have more negotiating powers leading to lower financing costs on average which in turn improves their overall stability in the market. Bawazir (2018) finds a positive relationship between profitability and financial stability. Hence, the study controls for bank profitability. Profitability is measured as the ratio of net income to total assets (ROA). The study expects a positive relationship between profitability and bank stability. Following Demirgüç-Kunt and Huizinga (2010) and Amidu and Wolfe (2013), the study uses the ratio of deposits to total liability to proxy for bank funding structure and liquidity sources of banks (Funding Structure). The study controls for funding structure because providers of funding have the incentive to monitor the bank and could withdraw their financing if doubts about bank stability arise.

To adjust for bank efficiency, the study includes the cost-to-income ratio. Since low values of the cost to income ratio indicate better managerial quality,

the study expects a positive relationship between the cost-to-income ratio and financial system stability. Prior studies (Beck, Demirgüç-kunt, & Merrouche, 2013; Schaeck & Čihák, 2008) document a positive relationship between bank efficiency and financial stability. Given that credit risk is the main source of risk in most banking systems (World Bank & International Monetary Fund, 2005), the study controls for the ratio of loan loss reserve (LLR) to gross loans as a measure for credit risk in banks (asset quality). High reserves, in terms of LLR ratio, are, indeed, associated with high insolvency risk and lower stability (Velliscig, Floreani, & Polato, 2022). Demirguc-Kunt (1989) and Barr and Siems (1994) offer evidence that failing institutions have large proportions of nonperforming loans prior to failure and that asset quality is a statistically significant predictor of insolvency. Failing banking institutions always have a high level of non-performing loans prior to failure.

As a measure of financial system stability, this study used the Z-Score which has widely been used by many scholars (Bawazir, 2018; Beck, Demirgüç-Kunt, & Levine, 2007; Boyd & Runkle, 1993; Demirgüç-Kunt, Detragiache, & Tressel, 2008; Laeven & Levine, 2009). It explicitly compares buffers (capitalization and returns) with risk (volatility of returns) to measure a bank's solvency risk. The Z-Score offers a measure of bank soundness because it specifies the number of standard deviations by which a bank's return on assets has to decline in order to consume all the capital of a bank or to trigger insolvency (Bawazir, 2018). The popularity of the Z-Score stems from the fact that it has a clear (negative) relationship to the probability of a financial institution's insolvency, that is, the probability that the value of its assets becomes lower than the value of its debt (World Bank, 2016). The higher the value of the Z-Score, the more solvent the bank and, therefore, it gives a direct measure of stability. The Z-score is calculated as follows:

$$\text{Z-Score} = \frac{ETA+ROA}{\sigma\text{ROA}}$$

Where ETA is the ratio of equity to total assets as a measure of bank capitalization, ROA is return on assets as a measure of profitability, and σROA is the standard deviation of return on assets as a proxy for return volatility.

The analysis uses local linear regression to estimate the causal effect of the LCR and NSFR on financial system stability. The local linear regression method is chosen because it allows for flexible functional forms and avoids the need to impose a global functional relationship between the independent variables and the outcome. The general approach is to estimate the effect of the liquidity ratios on the Z-score by comparing banks just above and just below the regulatory thresholds for LCR and NSFR compliance. The z-score is modeled as a function of LCR, NSFR, and control variables such as bank size, ROA, funding structure, loan loss reserve, and cost-to-income ratio (efficiency). The local linear regression model is specified as follows:

1. For the Liquidity Coverage Ratio:

$$Y_{it} = \beta_0 + \beta_1 Cutoff_{it} + \beta_2 \Delta LCR_{it} + \beta_3 (Cutoff_{it} * \Delta LCR_{it}) + \beta_4 X_{it} + \varepsilon$$

2. For the Net Stable Funding Ratio:

$$Y_{it} = \beta_0 + \beta_1 Cutoff_{it} + \beta_2 \Delta NSFR_{it} + \beta_3 (Cutoff_{it} * \Delta NSFR_{it}) + \beta_4 X_{it} + \varepsilon$$

Where:

$Z_{it}$ is the financial system stability of bank i at time t (measured by the Z-score),

$Cutoff_{it}$ is a dummy-coded treatment variable. The variable equals to 1 if bank i received treatment and 0 otherwise;

$\Delta LCR_{it}$ is the distance between bank i's LCR and the cutoff.

$\Delta NSFR_{it}$ represents the distance between bank i's NSFR and the cutoff.

$(Cutoff_{it} * \Delta LCR_{it})$ is an interaction term between the distance from the Cutoff value and a post-cutoff LCR.

$(Cutoff_{it} * \Delta NSFR_{it})$ is an interaction term between the distance from the Cutoff value and a post-cutoff NSFR.

$X_{it}$ is a vector of control variables (size, funding structure, non-interest income, cost-to-income ratio, and overhead cost).

$\varepsilon$ is the error term.

The coefficient of interest, $\beta_1$ for treatment assignment also called the local average treatment effect (LATE) represents the marginal impact of the policy

at the cut-off. Its magnitude identifies the direct impact of LCR and NSFR requirements on financial stability.

## Empirical Findings

### Summary Statistics

Table 1 shows descriptive statistics for every variable in the regression discontinuity models. It provides data on financial system stability, liquidity coverage ratio, net stable funding ratio, and the control variables. It also displays each variable's means, standard deviations, and minimum and maximum values.

*Table 1: Summary Statistics for Variables*

| Variables | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| **Dependent Variable** | | | | | |
| **Z-Score** | 168 | 19.569 | 14.621 | -42.82 | 74.79 |
| | | | | | |
| Independent Variables | | | | | |
| **LCR** | 168 | 253.82 | 150.85 | 34 | 911 |
| **NSFR** | 168 | 138.43 | 29.211 | 61 | 275 |
| **Control Variables** | | | | | |
| **ROA** | 168 | 1.6134 | 2.0629 | -9.53 | 10.68 |
| **Size** | 168 | 14.164 | 0.9501 | 11.96 | 16.28 |
| **FS** | 168 | 74.524 | 12.081 | 39.12 | 96.37 |
| **LLR** | 168 | 5.5395 | 5.442 | 1.09 | 42.45 |
| **Eff** | 168 | 69.343 | 22.643 | 29.1 | 177 |

### Test for Manipulation

The study tests the validity of the assumption that banks are not able to alter the assignment variables and also analyses the distributions of the assignment variables to search for violations of the exogenous treatment assumption in line with Bawazir (2018). Figure 1 displays histograms of the sample distributions of the assignment variables in 40 evenly spaced assignment

variables bins (with 0.03 wide intervals bin width), and the liquidity coverage ratio and net stable funding ratio requirements are represented on the x-axis. The graph demonstrates that there is no discernible grouping of units around the cut-off and since the distributions of the assignment variables are continuous near the cut-offs, no indication of exact manipulation is seen there.

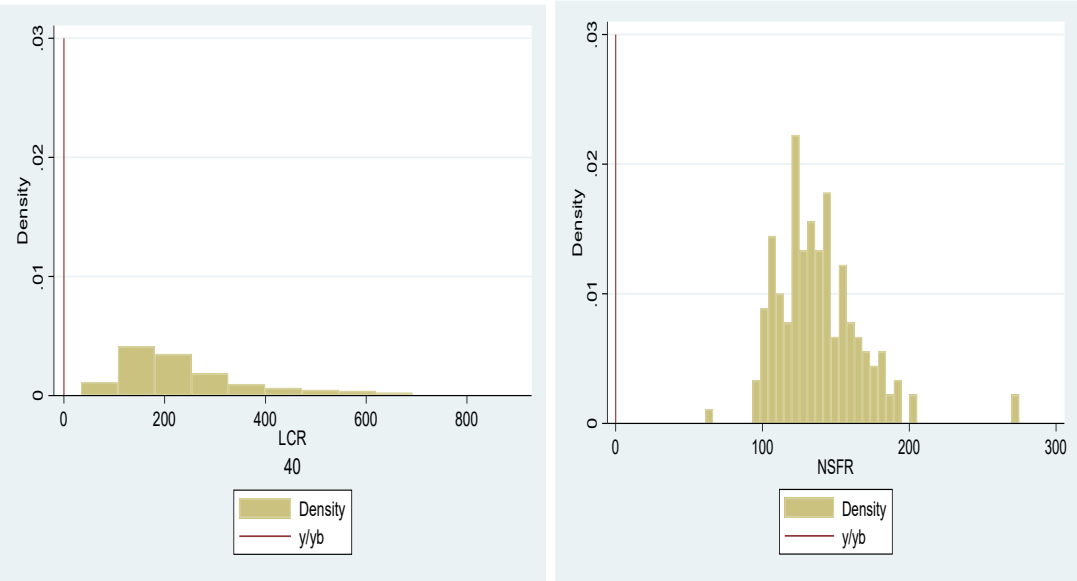


*Figure 1: Histograms of the Sample Distributions of LCR and NSFR*

## Test of Discontinuity

This study creates scatter plots of the relationship between the main variables (liquidity coverage ratio and net stable funding ratio) and the outcome variable (financial system stability as measured by Z-Score) to determine the existence of discontinuity at the thresholds (see figure 2). The scatter plots clearly show discontinuity in the stability of the financial system at the cutoffs (thresholds). It can be visualized that as the independent variables increase, financial system stability increases as well, indicating a positive correlation between the primary independent variables and financial system stability. The discontinuities provide strong evidence for causality between regulatory reform and financial system stability.

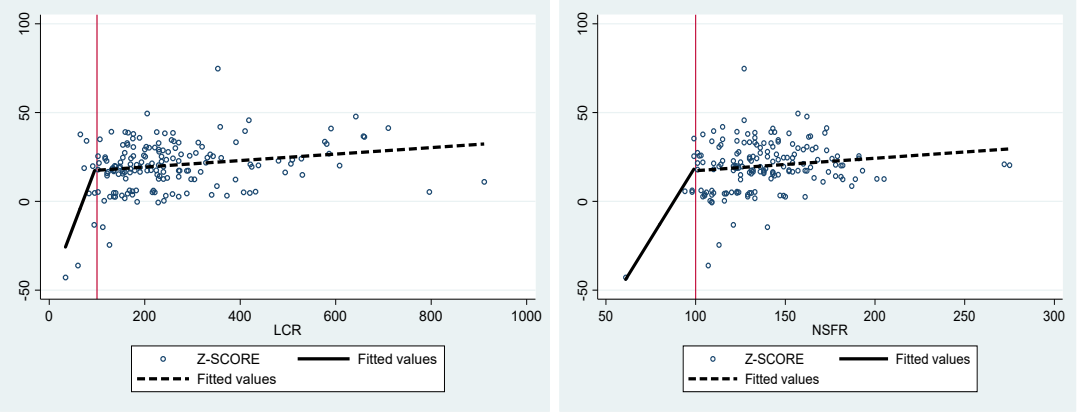


*Figure 2: Scatter Plots of the Relationship between the independent variables (LCR and NSFR) and the dependent variable (Financial System Stability as measured by the Z-Score)*

## Multicollinearity Test

A test was performed using the Variance Inflation Factor (VIF) to check for the magnitude of multicollinearity of the model terms. The results in Table 3 show that all the VIFs are less than 10, suggesting that there is no significant multicollinearity.

Table 3: Multicollinearty Results

| **Model 1: Liquidity Coverage Ratio and Financial System Stability** | | | **Model 2: Net Stable Funding Ratio and Financial System Stability** | | |
|---|---|---|---|---|---|
| **Variable** | 1/VIF | VIF | Variable | 1/VIF | VIF |
| **Liquidity Coverage Ratio** | 0.148 | 6.76 | Net Stable Funding Ratio | 0.113 | 8.88 |
| **Efficiency** | 0.557 | 1.79 | Efficiency | 0.525 | 1.90 |
| **Return on Assets** | 0.558 | 1.79 | Return on Assets | 0.594 | 1.68 |
| **Size** | 0.783 | 1.28 | Size | 0,799 | 1.25 |
| **Funding Structure** | 0.836 | 1.20 | Funding Structure | 0.833 | 1.20 |
| **Loan Loss Reserve** | 0.671 | 1.49 | Loan Loss Reserve | 0.881 | 1.13 |
| **Mean VIF** | | 3.18 | Mean VIF | | 4.06 |

## Baseline Results

### Liquidity Coverage Ratio and Financial System Stability

Table 4 presents the results of the regression discontinuity design model for liquidity coverage ratio and financial system stability in Nigeria. The coefficient of the dummy describing whether a bank's liquidity coverage ratio is above the threshold (cutoff) is positive and statistically significant, while the coefficients of both the distance of a bank's lcr to the cutoff (Δlcr) and the interaction between cutoff and Δlcr are insignificant. With regard to the control variables, coefficients of ROA (1.58**), SIZE (-2.60**) and FS (0.44***) have a significant impact on financial system stability while the coefficients of LLR (-0.28) and EFF (0.01) are insignificant.

To test the hypothesis, the study utilizes the p-value of the variable of interest (coefficient of cutoff) that measures the discontinuity in financial system stability at the threshold. With a coefficient of 5.81 and a p-value of 0.07*, it shows that the coefficient of the cutoff is positive and statistically significant at the 10% confidence level indicating that liquidity coverage ratio has a significant positive impact on financial system stability in Nigeria.

**Table 3: Empirical Results: Liquidity Coverage Ratio and Financial System Stability**

| Variables | | |
|---|---|---|
| Cutoff | 5.8135* | (3.1368) |
| ΔLCR | 0.0126 | (0.0162) |
| ΔLCR*Cutoff | -0.0093 | (0.0179) |
| ROA | 1.5817*** | (0.6085) |
| Size | -2.5994** | (1.1159) |
| Funding Structure | 0.4385*** | (0.0849) |
| Loan Loss Reserve | -0.2812 | (0.2105) |
| Efficiency (Cost-to-Income Ratio) | 0.0073 | (0.0555) |
| Constant | -55.9688*** | (18.0681) |
| Observations | 168 | |
| R-Squared | 0.3455 | |
| Standard errors in parentheses. *** p<0.01, significant at 1%; | | |
| ** p<0.05, significant at 5%; * p<0.1, significant at 10% | | |

The results suggest that higher liquidity requirements should have significant impact on financial stability of banks operating close to the regulatory minimum. Banks above the LCR threshold witnessed positive and significant Z-score. Specifically, the results reveal that meeting the LCR leads to a 5.81% increase in financial system stability. The findings imply that when the LCR requirement is implemented, the CBN's goal of improved financial stability will be achieved. Therefore, by implementing the LCR, the CBN could restore and maintain banking stability without resorting to ad-hoc bailouts and government interventions. The results provide support for the BCBS (2022) that implementing liquidity coverage ratio will reduce potential distress and promote financial stability. The findings are consistent with Chiaramonte and Casu (2016) who examined the impact of structural liquidity and capital ratios as specified by Basel III on banks' likelihood of failure across the EU-28 member states. They suggest that higher liquidity reserves reduce the risk of failure and distress. However, the findings are inconsistent with Yusgiantoro, Wirdiyanti, and Malinda (2019) who argue that liquidity requirement has a significant negative impact on financial stability.

### Net Stable Funding Ratio and Financial System Stability

Table 5 presents the results of the regression discontinuity design model for net stable funding ratio and financial system stability in Nigeria. The coefficient of the dummy describing whether a bank's net stable funding ratio is above the threshold (cutoff) is positive and statistically significant and the coefficient of the interaction between cutoff and ΔNSFR is negative and statistically significant, while the coefficient of the distance of a bank's NSFR to the cutoff (ΔNSFR) is insignificant. With regard to the control variables, coefficients of ROA (1.89***), SIZE (2.38**) and FS (0.40***) have a significant positive impact on financial system stability while the coefficients of LLR (-0.20) and EFF (-0.01) are insignificant.

To test the hypothesis, the study utilizes the p-value of the variable of interest (coefficient of cutoff) that measures the discontinuity in financial system

stability at the threshold. With a coefficient of 11.09 and a p-value of 0.001***, it shows that the coefficient of the cutoff is positive and statistically significant at the 1% confidence level, indicating that net stable funding ratio has a significant positive impact on financial system stability in Nigeria.

**Table 4: Empirical Results: Net Stable Funding Ratio and Financial System Stability**

| Variables | | |
|---|---|---|
| Cutoff | 11.0887*** | (3.3827) |
| ΔNSFR | 0.0834 | (0.0941) |
| ΔNSFR*Cutoff | -0.1809* | (0.1022) |
| ROA | 1.8878*** | (0.5803) |
| Size | 2.3830** | (1.0865) |
| Funding Structure | 0.4026*** | (0.0814) |
| Loan Loss Reserve | -0.2028 | (0.1858) |
| Efficiency (Cost-to-Income Ratio) | -0.0146 | (0.0562) |
| Constant | -49.6987*** | (17.9782) |
| Observations | 168 | |
| R-Squared | 0.3665 | |
| Standard errors in parentheses. *** p<0.01, significant at 1%; | | |
| ** p<0.05, significant at 5%; * p<0.1, significant at 10% | | |

The outcomes show that the NSFR requirements have advantages in enhancing the financial stability of deposit money banks in Nigeria. Specifically, the results reveal that meeting the NSFR leads to an 11.09% increase in financial system stability in Nigeria. This offers greater support for the view that higher liquidity buffers are a source of reducing potential bank distress and promoting financial stability. Higher asset liquidity directly benefits stability by encouraging banks to reduce the risks on their balance sheets and facilitating the liquidation of assets in a crisis. The plausible explanation for the positive and significant impact could likely be that banks in Nigeria maintained on their statements of financial position, a substantial amount of assets that can easily be converted to cash and a significant volume of stable liabilities which is consistent with the NSFR rule. The findings are

consistent with Bawazir (2018) who examined the impact of net stable funding ratio (NSFR), as described in Basel III, on risk and return for 500 banks in 28 European countries. He suggested that adherence to the NSFR requirements causes the financial stability of European banks to increase. However, the findings are inconsistent with Amara and Mabrouki (2019) who examined the impact of liquidity risks on the stability of Tunisian banks. Their findings show that liquidity risk does not have a significant impact on bank stability.

## Conclusion and Policy Implications

This study explored the impact of the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) on financial system stability in Nigeria following the global financial crisis. Employing a regression discontinuity design (RDD) to analyze data from 14 Nigerian banks over the period 2010 to 2021, the study found significant positive effects of both LCR and NSFR on financial stability, as measured by the z-score. The study's results show that banks with higher compliance to LCR and NSFR thresholds exhibited significantly improved z-scores, indicating reduced risk of insolvency and greater financial stability. These findings underscore the critical role of Basel III liquidity standards in enhancing the resilience of Nigeria's banking sector to systemic shocks. The regression results indicate that compliance with the LCR ensures that banks maintain sufficient high-quality liquid assets to survive short-term liquidity disruptions. Similarly, adherence to the NSFR promotes funding stability by aligning asset maturities with liability structures, thereby reducing risks associated with long-term illiquidity. Together, these metrics enhance banks' ability to withstand economic downturns, manage liquidity risk effectively, and contribute to the overall stability of the financial system.

The results highlight the need for robust regulatory oversight to ensure compliance with Basel III liquidity standards. The Central Bank of Nigeria (CBN) should continuously monitor banks' adherence to LCR and NSFR requirements, implement periodic stress tests to assess the effectiveness of these ratios in varying economic scenarios and provide clear guidelines and technical support to banks for compliance with liquidity regulations. Second, the positive impact of NSFR on financial stability highlights the importance of stable funding sources. Banks should be encouraged to diversify their funding

structures by tapping into long-term financing options such as bonds and equity markets. Third, to encourage banks to maintain high liquidity and stable funding levels, policymakers should consider tax incentives or reduced capital requirements for banks that consistently meet or exceed LCR and NSFR thresholds and differential risk-weighting schemes that favor assets and liabilities aligned with liquidity and funding stability principles. fourth, the effectiveness of LCR and NSFR depends significantly on the availability of high-quality liquid assets (HQLAs) and stable funding sources. To address this, the CBN and other stakeholders should develop a deeper and more liquid domestic financial market to increase the supply of HQLAs and encourage diversification of funding sources, including promoting retail deposits and long-term wholesale funding. Fifth, enhanced transparency in the reporting of liquidity metrics is essential for effective oversight. Regulators should require banks to disclose their LCR and NSFR metrics in their financial statements, allowing for better market discipline and stakeholder confidence. Finally, given the dynamic nature of financial markets and economic conditions, the regulatory framework should be flexible and adaptive. This entails regularly reviewing the LCR and NSFR thresholds to ensure their relevance in the Nigerian context and conducting research to evaluate the long-term impact of Basel III liquidity standards on financial system stability.

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