



**BASEL III LIQUIDITY REQUIREMENTS AND
BANK PROFITABILITY: EVIDENCE FROM
NIGERIA**

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Abstract

This paper examines the impact of Basel III liquidity requirements, specifically the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), on the profitability of banks in Nigeria, using regression discontinuity design (RDD) to analyze data from 14 banks over the period from 2009 to 2020. The study provides empirical insights into how these regulations influence bank performance, focusing on

return on assets (ROA) and return on equity (ROE). The results reveal that the LCR has a significant positive impact on ROA, indicating that holding adequate high-quality liquid assets improves

Keywords:

Liquidity coverage ratio, net stable funding ratio, bank profitability, return on assets, return on equity.

asset efficiency. However,

INTRODUCTION

Bank profitability is a critical indicator of the financial health and stability of the financial sector. It reflects a bank's ability to generate income, manage expenses, and provide returns to shareholders. Key profitability metrics include Return on Assets (ROA) and Return on Equity (ROE). These metrics provide insights into how well a bank utilizes its assets to generate returns and its effectiveness in generating profits for shareholders. Bank profitability has for many years been a topic of interest and has been recognized as a precondition for reducing bank failure. The interest is driven by increasing mergers in the banking sector, changes in production technology and regulation, and dissolving borders, both geographically and vis-à-vis related financial products and industries (Bikker & Bos, 2005). The 2007/2008 global financial crisis (GFC) has renewed

its effect on ROE is insignificant, suggesting that enhanced liquidity does not necessarily translate into higher returns for shareholders. Similarly, the NSFR shows a significant positive impact on ROA but an insignificant effect on ROE, highlighting the benefits of long-term funding stability for asset profitability without significantly boosting shareholder returns. These findings suggest that while Basel III liquidity requirements contribute to enhancing bank stability and

operational performance, they may not immediately result in higher equity returns in the Nigerian context. The study recommends that banks optimize their capital allocation and liquidity management strategies to achieve a balance between regulatory compliance and shareholder value. Additionally, regulators, particularly the Central Bank of Nigeria (CBN), should periodically review liquidity requirements to reflect the unique challenges of the Nigerian banking environment. This

study contributes to the existing literature by providing empirical evidence on the impact of Basel III liquidity requirements on bank profitability in the Nigerian context. The use of Regression Discontinuity Design offers a robust approach to identifying causal effects, enriching the understanding of how liquidity management practices affect financial performance, particularly in emerging markets where liquidity risks are more pronounced.

• interest among regulators, policymakers, and banking professionals on the significance of bank profitability for bank survival. The banking sector's profitability shrunk considerably during the crisis due to increased loan defaults, write-downs of toxic assets, and a general contraction in economic activity. Bank profitability declined sharply during the GFC (Xu, Hu, & Das, 2019).

The GFC exposed severe weaknesses in the global banking system, leading to huge losses and the collapse of many global banks. The depth and severity of the crisis were amplified by weaknesses in the banking sector including insufficient liquidity buffers. A failure to adequately monitor and control liquidity risk led several financial firms into difficulty (Financial Stability Board [FSB], 2011; International Monetary Fund [IMF], 2010; Moreni, 2011). In response to the crisis, global regulatory bodies, including the Basel Committee on Banking Supervision (BCBS), introduced a series of reforms to enhance banks' resilience and mitigate systemic risks. These reforms culminated in the introduction of Basel III at the end of 2010 designed to strengthen banks' regulation, supervision, and risk management. One of the central components of Basel III is the introduction of liquidity requirements, which include the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) (BCBS, 2010; BCBS, 2014; FSI, 2018a; FSI, 2018b). The LCR requires banks to hold a sufficient amount of unencumbered high-quality liquid assets (HQLAs) to cover their net cash outflows over a 30-day stress period, while the NSFR requires banks to maintain a stable funding structure relative to their assets over a one-year horizon to promote longer-term resilience. The liquidity requirements are designed to ensure that banks maintain adequate liquidity buffers to

withstand short-term and long-term liquidity stresses, thereby reducing the risk of liquidity shortfalls and enhancing overall financial stability.

In Nigeria, the banking sector was not immune to the impacts of the global financial crisis. The GFC precipitated a significant downturn in the Nigerian economy, characterized by a decline in oil prices, capital flight, and a contraction in foreign reserves. The banking sector, which was heavily exposed to the oil and gas industry and the capital markets, experienced a severe liquidity crunch. Several banks experienced liquidity shortfalls, decline in profitability, and solvency issues, leading to a crisis of confidence in the sector. The Central Bank of Nigeria (CBN) undertook a series of reform measures to stabilize the sector, restore confidence, and align with international best practices. The CBN injected over ₦600 billion into the banking sector to provide liquidity support and ensure that affected banks could continue their operations (Sanusi, 2010). This intervention was complemented by the establishment of Asset Management Corporation of Nigeria (AMCON) in 2010 to address the issue of non-performing loans (NPLs) and recapitalize distressed banks, thereby restoring stability and confidence in the financial system. These measures, coupled with a series of regulatory reforms aimed at enhancing transparency, corporate governance, and risk management, helped to stabilize the banking sector in the short term, however, the crisis also highlighted the need for a more robust regulatory framework to prevent a recurrence, paving the way for the adoption of the Basel III framework in Nigeria, which aims to strengthen further the banking sector's ability to withstand liquidity shocks and enhance profitability through prudent risk management. In 2013, the Central Bank of Nigeria directed all commercial banks to implement Basel II/III commencing with the implementation of pillar I of Basel II in January 2014 and after completing the development of the guidelines for Basel III implementation, it released the guidelines and reporting templates and directed banks to commence Basel III implementation in November 2021. The CBN's directive in 2021 for banks to implement Basel III marked a significant shift in the regulatory landscape, particularly with the introduction of stringent liquidity requirements, such as the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). These requirements are intended to ensure that banks maintain adequate levels of high-quality liquid assets to withstand short-term liquidity disruptions and promote long-term stability in their funding structures. However, the potential impact of these regulations on bank performance, such as reduced profitability and a squeeze on lending margins, has raised concerns among stakeholders, given the historically thin profit margins in the Nigerian banking sector. While there is a growing body of literature on the impact of Basel III on bank profitability globally, studies focusing on Nigeria are relatively sparse. The unique characteristics of the Nigerian economy and banking sector, including its dependence on oil revenues, exposure to foreign exchange volatility, and regulatory environment, necessitate a country-specific study. Moreover, the Nigerian banking sector has undergone significant structural changes since the GFC, including consolidation, recapitalization, and increased regulatory oversight. These changes may have altered the dynamics of bank profitability and liquidity management, making it essential to understand how Basel III requirements interact with these evolving conditions. This study fills a gap in the existing literature by focusing on the Nigerian context, where the adoption of Basel III is relatively recent, and

its implications on bank profitability have not been extensively studied. It offers a detailed perspective by employing a Regression Discontinuity Design (RDD) to capture the causal effects of Basel III adoption.

This study differs from existing studies in several ways. First, is the use of the regression discontinuity design (RDD) as the methodological approach. Many existing studies have utilized traditional econometric methods such as panel data analysis, event study analysis, time series, or ordinary least squares (OLS) regression to examine the relationship between liquidity requirements and profitability. While useful, these methods may not fully capture causal relationships or account for exogenous shocks, such as regulatory changes. In contrast, the RDD approach used in this study capitalizes on a "cutoff point," such as the official implementation of Basel III regulations. It leverages the natural experiment created by the sudden introduction of these requirements to identify the causal impact on profitability. This methodological approach addresses potential endogeneity issues that may arise from other factors influencing profitability, providing a clearer picture of the impact of Basel III on the Nigerian banking sector.

Second, is its focus on Nigeria, an emerging market economy with unique regulatory, economic, and financial conditions. Much of the existing literature on Basel III has concentrated on advanced economies, particularly in Europe and North America, where banking systems and regulatory frameworks differ significantly from those in developing markets like Nigeria. Previous studies may have limited applicability to Nigeria due to differences in market structure, regulatory enforcement, and macroeconomic stability. This study fills this gap by examining Nigerian banks, providing context-specific insights into how Basel III liquidity requirements impact profitability in a developing market setting. The Nigerian banking sector faced unique challenges during the study period (2009-2020), including regulatory reforms, currency fluctuations, oil price shocks, and political instability, all of which could affect how banks respond to Basel III regulations. By focusing on Nigeria, this study offers insights that are relevant not only to the country but also to other emerging markets with similar characteristics.

Furthermore, previous Nigerian studies focused on traditional measures of liquidity, such as the current ratio, quick ratio, and cash ratio. In contrast, we use the two measures of liquidity recommended by the Basel Committee on Banking Supervision in the Basel III framework: liquidity coverage ratio and net stable funding ratio. These two measures are more broad-based and encompass short-term and long-term liquidity-related variables that are important for policy-making decisions. Finally, most previous studies have examined the short-term impact of Basel III liquidity requirements on bank performance, often limiting their analysis to a few years post-implementation. In contrast, this study covers a broader timeline (2009-2020). This longer timeframe allows for a more comprehensive analysis of profitability trends and how banks adjusted their liquidity positions over time in response to evolving regulations.

The rest of the paper is structured as follows: Section 2 discusses the underpinning theory and relevant empirical studies on Basel III liquidity requirements and bank profitability. Section 3 outlines the research methodology, including the use of Regression Discontinuity Design (RDD) to analyze the impact of Basel III on bank profitability. It details the data sources, sample selection, and model specification. Section 4 presents the

empirical findings, discussing the impact of Basel III liquidity requirements on profitability measures such as ROA, ROE, and NIM. Section 5 summarizes the key findings and provides policy recommendations for regulators and banking professionals.

Literature Review and Hypotheses Development

The implementation of Basel III liquidity requirements has attracted significant scholarly attention due to its implications for the stability and profitability of banks worldwide. For the Nigerian banking sector, understanding the relationship between regulatory compliance and profitability is crucial, given the sector's vulnerability to economic shocks and structural challenges. This literature review provides an overview of the theoretical and empirical studies on the impact of Basel III liquidity requirements on bank profitability. The review begins with an in-depth discussion of the Shiftability Theory, which serves as the underpinning theoretical framework for this study. It then examines empirical studies that explore the impact of Basel III liquidity requirements, both globally and in the Nigerian context.

Theoretical Review: Shiftability Theory

The Shiftability Theory of banking, proposed by Harold G. Moulton in 1918, provides a robust theoretical foundation for understanding the liquidity management strategies of banks. It posits that a bank's liquidity is not solely dependent on its cash reserves but also on its ability to convert other assets into cash without incurring significant losses. This theory arose as a critique of the earlier Real Bills Doctrine and Commercial Loan Theory, which were more restrictive in their view of what constitutes a liquid asset. According to the Real Bills Doctrine, banks should hold only short-term, self-liquidating loans that are related to commercial activities, as they automatically convert to cash when they mature. The Commercial Loan Theory similarly advocated that banks should primarily engage in short-term lending to maintain liquidity. However, these theories were criticized for their narrow focus and failure to consider the evolving financial landscape, which increasingly included a variety of marketable securities that could serve as liquid assets.

Moulton's Shiftability Theory, in contrast, argues that a bank's liquidity is enhanced if it holds assets that are easily "shiftable", or transferable, to other financial institutions in exchange for cash or cash equivalents. These shiftable assets include government securities, high-quality commercial paper, and other marketable instruments that can be sold quickly or used as collateral to obtain liquidity in the financial markets. This broader definition of liquidity allows banks greater flexibility in managing their balance sheets and responding to liquidity pressures. The theory suggests that the liquidity of a bank's asset portfolio is not just a function of the assets it holds but also the conditions of the secondary markets in which these assets can be traded. If a bank holds a significant amount of high-quality assets that are easily tradable, it can maintain liquidity even in adverse conditions by shifting these assets into cash. This theory underscores the importance of a diversified asset portfolio that includes readily marketable instruments, as opposed to a narrow focus on holding liquid cash or short-term loans.

The Shiftability Theory is particularly relevant in the context of modern banking regulation, especially the Basel III framework. Basel III introduced stringent liquidity

requirements, including the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), which are designed to ensure that banks maintain adequate liquidity buffers to withstand periods of financial stress. The LCR requires banks to hold a sufficient stock of High-Quality Liquid Assets (HQLAs) that can be easily and quickly converted into cash to meet short-term obligations over a 30-day period under a stress scenario. This requirement aligns with the Shiftability Theory's emphasis on holding assets that can be readily converted into cash. The NSFR complements the LCR by promoting stable funding structures over a longer time horizon, typically one year. The NSFR aims to reduce funding mismatches by requiring banks to maintain a stable funding profile relative to the composition of their assets and off-balance-sheet activities. Both ratios represent a comprehensive approach to liquidity management that resonates with the Shiftability Theory's emphasis on asset quality and marketability.

In applying Shiftability Theory to the Nigerian banking sector, it is important to consider the unique challenges that banks face in maintaining liquidity. The availability of HQLAs in Nigeria is limited, as the market for government securities and other low-risk, high-quality instruments is relatively shallow compared to developed economies. Moreover, Nigerian banks are heavily exposed to macroeconomic volatility, including fluctuations in oil prices, exchange rate instability, and inflationary pressures, which can affect the liquidity and marketability of their assets. As such, the Shiftability Theory provides a useful framework for analyzing how Nigerian banks manage their liquidity positions in response to regulatory requirements like Basel III, particularly in an environment where the traditional tools for liquidity management may be less effective.

Empirical Review and Hypotheses Development

Empirical studies on the impact of Basel III liquidity requirements on bank profitability have been conducted extensively in developed markets but are less prevalent in developing economies like Nigeria. The results of these studies are mixed, reflecting variations in banking structures, regulatory environments, and market conditions across different jurisdictions. This section reviews relevant empirical findings from both global and Nigerian contexts, focusing on the relationship between Basel III liquidity requirements and bank profitability.

Globally, several studies have investigated the impact of Basel III liquidity requirements on bank performance metrics such as Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). For instance, a study by King (2013) conducted across 15 countries, including major banking markets in Europe and North America, found that higher liquidity requirements under the NSFR reduced profitability, particularly in the early years of implementation. The study showed that the increased focus on maintaining liquid assets meant a shift away from more lucrative but illiquid investments. Consequently, banks faced a squeeze on their net interest margins, a key driver of profitability. Similarly, Bawazir (2018) investigated the effects of the net stable funding ratio (NSFR) on the risk and return of 500 banks in 28 European countries. Utilizing a regression discontinuity design analysis, the research provided evidence of a trade-off between liquidity and profitability in banks, as the opportunity cost of holding high-quality liquid assets (HQLA) limits the banks' ability to generate revenue from higher-

yielding investments resulting in decline in profitability. Equally, using regression discontinuity design to analyze the dataset from Dutch banks, Bonner and Eijffinger (2016) noted that while the liquidity requirement (similar to the LCR) strengthened liquidity profiles, banks reported reduced interest margins due to the lower yield on liquid assets. They suggested that banks in developed economies with more mature financial markets might find it easier to comply with the LCR without severely affecting profitability by diversifying into fee-based income activities. Still, this strategy is less feasible for banks in developing economies like Nigeria. Also, Sidhu, Rastogi, Gupte, and Bhimavarapu (2022) analyzed the Indian banking sector from 2010 to 2019 and reported a decline in net interest margins following the introduction of liquidity coverage ratio (LCR). The study attributed this decline to the increased cost of maintaining high quality liquid assets (HQLAs), which typically offer lower returns compared to riskier assets.

Another study by Bonner (2016) examined the impact of liquidity coverage ratio on Dutch banks using the seemingly Unrelated Regressions (SUR) approach to analyze a dataset covering June 2009 to December 2012 and found that the LCR negatively affected profitability. The study suggested that the mandatory holding of liquid assets such as government bonds, which offer lower returns, led to a reduction in interest income. However, Bonner also noted that the impact varied across banks, depending on their business models and the composition of their asset portfolios. Banks with more diversified income sources and those that were able to pass on the cost of holding additional liquidity to their customers experienced less of a profitability decline. These findings suggest that while the LCR enhances liquidity and stability, it may also constrain profitability, particularly in low-interest-rate environments where the yield on HQLAs is minimal. Mahisi and Usman (2024) employed panel data regression to analyze data from 20 commercial banks in Indonesia and reported that the Net Stable Funding Ratio has a significant positive impact on Net Interest Margin and an insignificant impact on Return on assets while the Liquidity Coverage Ratio has an insignificant impact on both Return on Assets and Net Interest Margin.

In contrast to these findings, some studies have reported positive effects of Basel III liquidity requirements on bank profitability. For example, Mashamba (2018) assessed the impact of Basel III liquidity regulations on the profitability of banks in emerging market economies. Using the Generalized Method of Moments (GMM) estimator to analyze data from 40 banks operating in 11 emerging markets over the period 2011 to 2016, he reported an increase in profitability following the introduction of the liquidity coverage ratio. Similarly, Veeramoothoo and Hammoudeh (2022) studied the impact of the Basel III liquidity regulations on bank profitability by employing the simultaneous quantile regression method with time fixed effects to analyze quarterly bank-level data of U.S. commercial banks from the first quarter of 2010 through the third quarter of 2017. They found a significant positive relationship between the LCR and profitability and the NSFR and profitability over most quantiles.

However, some studies found an insignificant impact of liquidity requirements on bank profitability. Giordana and Schumacher (2017) analyzed how the net stable funding ratio (NSFR) and the liquidity coverage ratio (LCR) affect bank profitability measured by return on assets (ROA). Using ordinary least squares (OLS), fixed effects (FE), and the

generalized method of moments (GMM) to evaluate data from the 50 largest banks in Luxembourg from 2003 to 2011, they concluded that liquidity regulation did not have a clear-cut effect on profitability. Similarly, Dietrich, Hess, and Wanzenried (2014) investigated the impact of the Net Stable Funding Ratio (NSFR) on bank performance by applying the Generalized Method of Moments (GMM) to analyze data from 921 banks in Western Europe over the period from 1996 to 2010. Their findings provided empirical evidence that the NSFR does not significantly impact the profitability of individual banks, as indicated by returns on assets, returns on equity, or net interest margins. Golubeva, Duljic, and Keminien (2019) investigated the impact of liquidity coverage ratio on bank profitability by analyzing a dataset of 45 European banks from 2014 to 2018 using OLS and Weighted Least Squares regressions. They found an insignificant relationship between LCR and bank profitability.

In the Nigerian context, the literature on the impact of liquidity requirements on bank profitability is relatively sparse, with most studies focusing on traditional liquidity measures. For example, Wuave, Yua, and Yua (2020) investigated the effect of liquidity management on the financial performance of banks in Nigeria, using data from 2010 to 2018. The study employed a panel regression approach for the analysis and found that liquidity ratio has a positive and significant effect on the financial performance of deposit money banks as measured by return on assets (ROA), return on equity (ROE), and net interest margin (NIM). Another study by Obi-Nwosu, Okaro, Ogbonna, and Atsanani (2017) examined the effect of liquidity management on the financial performance of deposit money banks in Nigeria, using data from 2000 to 2015. The study used ordinary least squares and Granger causality to analyze the relationship between various liquidity ratios and bank profitability indicators such as ROA and ROE. The findings indicated that liquidity management practices exerted downward pressure on profitability. Also, Edem (2017), employing a multiple regression approach to analyze data from 24 banks over the period 1986 to 2011, identified a positive and significant relationship between liquidity management and the performance of deposit money banks in Nigeria. Kajola, Sanyaolu, Alao and Ojunrongbe (2019) examined the impact of liquidity management on profitability by analyzing data from 10 deposit money banks in Nigeria between 2008 and 2017. Using random effects generalized least squares, the study found a positive and statistically significant relationship between two liquidity management indicators (current ratio and liquidity ratio) and return on assets. **Ibe (2013)** investigated liquidity management and bank profitability in Nigeria and found a negative relationship between high liquidity levels and profitability. This finding supports the view that holding large amounts of liquid assets (as required by LCR) may reduce profitability since these assets often yield lower returns compared to other types of assets like loans and investments.

These studies suggest that the impact of Basel III liquidity requirements on profitability is context-dependent and may vary based on the specific characteristics of the banking sector and the regulatory environment. While some studies have reported negative effects due to the high cost of holding liquid assets, others have found positive effects linked to improved funding stability and operational efficiency. In the Nigerian context, there is a need for more focused research on how Basel III liquidity requirements affect bank profitability, considering the unique structural and macroeconomic challenges faced by

the banking sector. This study aims to fill this gap by employing a rigorous empirical approach to analyze the impact of Basel III liquidity requirements on the profitability of deposit money banks in Nigeria, using a comprehensive dataset covering the period from 2009 to 2020. Given the findings from the empirical literature, it is reasonable to hypothesize that higher liquidity coverage may constrain bank profitability in Nigeria due to the opportunity cost associated with holding high-quality liquid assets. Likewise, we hypothesize that higher levels of stable funding as required by the NSFR could have a negative short-term impact on bank profitability in Nigeria. Below are the hypotheses:

H1: Liquidity Coverage Ratio has a significant negative impact on bank profitability in Nigeria.

H2: Net Stable Funding Ratio has a significant negative impact on bank profitability in Nigeria.

Data and Methodology

A. Data Sources

The sample consists of 14 deposit money banks (DMBs) operating in Nigeria as at the end of 2020, selected based on several criteria, including size, market share, and availability of consistent financial data over the study period. These banks collectively account for over 80% of the total assets, deposits, and loans in the Nigerian banking sector, making them highly representative of the industry. The study utilizes secondary data covering the period from 2009 to 2020 collected from the annual financial reports of the selected banks, Central Bank of Nigeria (CBN) reports, and other regulatory filings for the key variables. The key variables include profitability measures such as ROA and ROE (dependent variables) and liquidity ratios such as LCR and NSFR (independent variables), along with control variables like bank size, funding structure, non-interest income, cost-to-income ratio, and overhead cost.

B. Model Specification

The data were analyzed using Regression Discontinuity Design (RDD), which relies on local randomization, assuming that the differences between banks that are just above and just below a threshold occur randomly. RDD is a quasi-experimental method used to evaluate the effects of a policy or intervention, particularly when participants are assigned based on whether they exceed or fall short of a pre-determined threshold on a continuously measured variable. RDD has been widely used in various quantitative studies to assess the impact of diverse intervention programs. A review of empirical studies on economic topics shows that over sixty studies have applied RDD (Lee & Lemieux, 2010).

The Basel III framework offers explicit threshold rules, enabling this study to focus on a "sharp" design, where participants receive treatment or control conditions based on whether they meet the predetermined thresholds. In sharp designs, treatment is directly determined by the running variable (in this case, the liquidity coverage ratio and net stable funding ratio). Thus, banks that consistently meet the minimum thresholds set by the Basel Committee are assigned to the treatment group.

An important requirement for interpreting RDD estimates causally is that banks cannot precisely manipulate their running variables around the cut-off. If they could,

it would violate the assumption that banks are assigned to the intervention in a way comparable to random assignment. The strength of this design lies in the fact that, as long as participants cannot manipulate the running variables, the assignment to the policy or intervention is effectively random for those near the cut-off (Jacob, Zhu, Somers, & Bloom, 2012). The Central Bank of Nigeria (CBN) announced the implementation of Basel III in September 2021, and by limiting the data sample to 2020, the study avoids including banks that might have altered their financial activities in response to Basel III. To validate the assumption that banks are not able to manipulate the running variables, we conducted a test by analyzing the distribution of the running variables to check for any violations of the exogenous treatment assignment using histograms.

Given the lack of publicly available data for certain components of the LCR and NSFR for Nigerian banks, assumptions were made based on the CBN (2021) guidelines for Basel III implementation and adopting a conservative approach. These assumptions were designed to be as realistic as possible, grounded in market evidence, and considering regulatory specifics.

- a. It is assumed that HQLAs consist of cash, Nigerian Treasury Bills, and Federal Government bonds, as these are the most liquid and marketable assets available to Nigerian banks.
- b. All loans are assumed to have maturities exceeding one year and are assigned an RSF factor of 85%
- c. Fixed assets and non-earning assets (excluding cash and due from banks) are assigned an RSF factor of 100%.
- d. Due to the lack of data distinguishing between stable and less stable customer deposits, all customer deposits are assigned an Available Stable Funding (ASF) factor of 70% and a run-off rate of 30%.
- e. Long-term borrowing and equity are treated as stable funding over a one-year time horizon.
- f. Government securities are assigned an RSF factor of 5%, while securities held in available-for-sale or trading portfolios (such as equities and corporate bonds) are assigned an RSF factor of 50%.

This study incorporates several bank-specific control variables in the regression analysis to account for factors that may influence bank profitability, such as bank size, funding structure (FS), overhead costs (OC), non-interest income (NII), and cost-to-income ratio (efficiency), all of which have been used in prior studies.

- ❖ **Bank Size (SIZE):** Measured as the natural logarithm of total assets. Larger banks typically benefit from economies of scale and may have more diversified portfolios and access to stable funding sources, potentially leading to higher profitability (Brighi & Venturelli, 2014; Haan & Poghosyan, 2012).
- ❖ **Funding Structure (FS):** Measured as the ratio of customer deposits to total liabilities. A higher proportion of deposits indicates a more stable and low-cost funding base, which positively impacts profitability (Amidu & Wolfe, 2013; Bawazir, 2018; Demirgüç-Kunt & Huizinga, 2010).

- ❖ **Cost-to-Income Ratio (EFF):** Calculated as operating expenses divided by operating income. This variable reflects the operational efficiency of the bank. A lower cost-to-income ratio indicates greater efficiency, which is expected to have a positive effect on profitability. Banks with lower cost-to-income ratios are generally more profitable.
- ❖ **Overhead Cost (OC):** Measured as the ratio of personnel expenses and other overhead costs to total assets. Higher overhead costs are expected to negatively impact profitability, particularly if they are not offset by corresponding increases in income.
- ❖ **Non-Interest Income (NII):** Measured as the ratio of non-interest income to operating income. Non-interest income includes fees, commissions, and other sources of revenue not tied to lending. A higher non-interest income ratio is associated with diversified income streams, which can enhance profitability, particularly during periods of low interest rates or weak lending conditions (Demirgüç-Kunt and Huizinga, 2010).

Following Lee and Lemieux (2010), the treatment is represented by a dummy variable $D \in \{0, 1\}$, where $D = 1$ if $X \geq c$ and $D = 0$ if $X < c$, with X representing the running variable and c the cut-off point. Also, based on Lee and Lemieux (2010), the study employs a rectangular kernel, equivalent to estimating a standard regression within a bandwidth h on both sides of the cut-off. The study uses a local linear regression technique, a non-parametric approach that treats the treatment effects as arising from local randomization. The analysis is limited to observations close to the cut-off, where the functional form is likely to be more linear. The regression equation's functional form is expressed as follows:

$$Y_{it} = \beta_0 + \beta_1 D_{it} + \beta_2 R_{it} + \beta_3 D_{it} * R_{it} + \beta_4 W_{it} + \varepsilon$$

Where:

Y_{it} = profitability measures (ROA, ROE) for bank i at time t ;

D_{it} = dummy-coded treatment variable. The variable equals to 1 if bank i received treatment and 0 otherwise;

W_{it} = the vector of all predetermined and observable characteristics of the bank that might impact the outcome;

$R_{it} = X - c$ = the distance between the running variable (X) and the treatment cut-off (c);

$D_{it} * Z_{it}$ = an interaction term between the distance from the Cutoff value and a post-cutoff running variable indicator.

ε = the error term.

β_0 = the average value of the outcome for those in the treatment group after controlling for the running variable.

The coefficient of interest, β_1 for treatment assignment also called the local average treatment effect (LATE) represents the marginal impact of the programme/policy at the cut-off/threshold. Its magnitude identifies the direct impact of the running variables on financial stability.

Empirical Findings

Summary Statistics

Table 1 presents descriptive statistics for all variables used in the regression discontinuity models. It reports banks profitability statistics and liquidity requirement measures as well as the control variables. Additionally, it shows the means, standard deviations, minimum and maximum values for each variable.

Table 1: Summary Statistics for Variables

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Dependent Variables					
ROE	168	6.7440	41.9717	-394.32	154.47
ROA	168	1.4675	2.3072	-9.53	10.68
Independent Variables					
LCR	168	263.4345	151.8922	33.00	911.00
NSFR	168	135.4345	26.6442	61.00	229.00
Control Variables					
Size	168	14.0196	0.9518	11.87	15.98
Funding Structure	168	75.3827	11.7262	39.12	96.37
Overhead Cost	168	6.5705	4.0831	2.10	43.91
Non-Interest Income	168	38.4344	10.2626	6.05	68.77
Cost to Income Ratio	168	70.0914	23.5010	29.10	177.00

Test for Manipulation

The study conducts a test to check the validity of the assumption that banks are not able to manipulate the assignment variables (liquidity coverage ratio and net stable funding ratio). The study examines the assignment variables' distributions to check for violations of the exogenous treatment assignment (Bawazir, 2018). Figure 1 shows histograms of the sample distributions of the assignment variables in 40 equally spaced assignment variables bins (with 0.03 wide intervals bin width), and the x-axis represents the liquidity coverage ratio and net stable funding ratio. The figure shows that there is no clear bunching of units around the cut-off. The assignment variables' distributions are

continuous within close proximity of the cut-offs, and thus no evidence of precise manipulation is observed at the cutoff points.

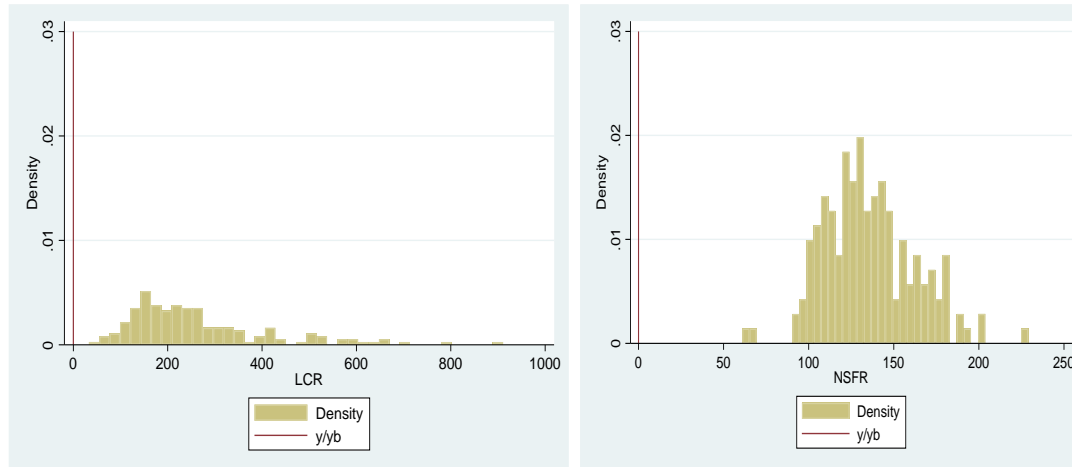


Figure 1 Histograms of the sample distributions of liquidity coverage ratio (LCR) and net stable funding ratio (NSFR)

Multicollinearity Test

The study performs a test to identify multicollinearity by examining the correlation matrix of the independent variables. Table 2 displays the correlation matrix for the sample. The findings indicate the extent of relationships among the variables. It is evident that there is no significant correlation between the independent variables, suggesting that multicollinearity is not an issue.

Table 2: Correlation Matrix for all Independent Variables

	LCR	NSFR	Size	FS	NII	OC	EFF
LCR	1						
NSFR	0.3280	1					
Size	-0.0453	0.2725	1				
FS	0.2906	0.3013	-0.0281	1			
NII	0.1610	0.2454	-0.1260	-0.0460	1		
OC	-0.1089	-0.4470	-0.4020	-0.0773	-0.2620	1	
EFF	-0.1569	-0.3692	-0.3730	-0.1326	0.0137	0.2808	1

Baseline Results

Liquidity Coverage Ratio and Profitability

Table 3 presents point estimates of the profitability discontinuity at the Cutoff liquidity level from a baseline specification in which they are regressed on an indicator of LCR level above 100% (Cutoff), the distance between a bank's LCR to the Cutoff (ΔLCR), their interaction (Cutoff* ΔLCR) and a constant. The results indicate that the distance of a bank's LCR to the Cutoff (ΔLCR) has a positive and significant effect on both return on

equity (ROE) and return on assets (ROA), while the interaction between Cutoff and Δ LCR negatively and significantly impacts both ROE and ROA. Regarding the control variables, overhead costs and the cost-to-income ratio have a negative and significant effect on both ROE and ROA, while size and funding structure do not significantly influence either ROE or ROA. However, non-interest income positively and significantly impacts ROA but has no effect on ROE.

The main parameter of interest is the coefficient of the Cutoff, which estimates the average treatment effect. While there is no significant effect of maintaining a higher LCR on bank profitability as measured by ROE, there is a positive and significant impact of LCR on ROA. This suggests that, when holding all other independent variables constant, higher LCR requirements should significantly affect the ROA of banks operating near the regulatory minimum. Banks exceeding the LCR threshold experienced a positive and significant ROA at the 10% confidence level. Specifically, the results indicate that meeting the LCR requirement results in a 0.69% increase in ROA.

The finding related to ROA aligns with Mashamba (2018), who investigated the impact of liquidity regulations on the profitability of banks in emerging economies. He found that regulatory pressures from the liquidity coverage ratio requirement enhanced the profitability of these banks. This finding also supports the shiftability theory, which posits that banks should hold a substantial amount of assets that can be quickly converted to cash without significant loss, thus eliminating the need to maintain large reserves of idle cash that could be invested in earning assets, ultimately increasing income. Similarly, the result concerning ROE is consistent with Golubeva et al. (2019), who studied the impact of liquidity on bank profitability in Europe following the implementation of Basel III. They concluded that the liquidity coverage ratio does not have a significant effect on profitability.

Table 3: Empirical Results: Liquidity Coverage Ratio and Profitability

	1	2
Variables	ROE	ROA
Cutoff	6.867 (9.794)	0.658* (0.363)
ΔLCR	0.121*** (0.040)	0.009*** (0.002)
ΔLCR*Cutoff	-0.109** (0.047)	-0.008*** (0.002)
Size	0.893 (3.761)	-0.225 (0.139)
Funding Structure	-0.193 (0.266)	-0.007 (0.010)
Non-Interest Income	-0.069 (0.324)	0.026** (0.012)
Overhead Cost	-1.923** (0.839)	-0.277*** (0.031)

Cost-to-Income Ratio	-0.669*** (0.143)	-0.045*** (0.005)
Constant	60.931 (66.683)	8.279*** (2.472)
Observations	168	168
R-Squared	0.247	0.658
Standard errors in parentheses. *** p<0.01, significant at 1%;		
** p<0.05, significant at 5%; * p<0.1, significant at 10%		

Net Stable Funding Ratio and Profitability

Table 4 displays the results of the nonparametric local linear regression estimates. The outcome variables are return on equity (ROE) in column 1 and return on assets (ROA) in column 2. The distance of a bank's net stable funding ratio (NSFR) from the Cutoff (Δ NSFR) and the interaction between Cutoff and Δ LCR do not show any significant effects on either ROE or ROA. Concerning the control variables, overhead costs and the cost-to-income ratio have a negative and significant impact on both ROE and ROA, while funding structure does not significantly affect either measure. Non-interest income positively and significantly influences ROA but has no effect on ROE, while bank size negatively and significantly impacts ROA without affecting ROE.

The main parameter of interest is the coefficient of the Cutoff, which estimates the average treatment effect. Similar to LCR, we find no significant effect of maintaining a higher NSFR on bank profitability as measured by ROE; however, NSFR does have a positive and significant impact on ROA. Generally, banks operating above the 100% threshold achieve positive ROA. All things being equal, an increase in NSFR is associated with a rise in ROA. Specifically, banks above the Cutoff experience an average increase of approximately 0.81% in return on assets, suggesting that for each percentage point increase in NSFR, ROA is expected to rise by 0.81%, holding all other independent variables constant. This result is statistically significant at the 10% confidence level.

The finding related to ROA aligns with the conclusions of Edem (2017) and Yusuf, Nwugo, and Chima (2019), who assert that liquidity significantly impacts bank profitability. Additionally, this finding supports the notion that funding markets reward banks to some extent for holding liquid assets, thereby mitigating liquidity risk. It suggests that deposit money banks in Nigeria should consider developing new business strategies to enhance their profitability in light of increasing regulatory pressure. Given the introduction of the NSFR, shareholders' demands for high returns will persist, potentially prompting banks to seek excessive risks in other areas. The banks' ability to manage the stability of their funding sources and the liquidity of their assets provides them with a competitive advantage, translating into higher profitability. The findings related to ROE are consistent with the research of Golubeva et al. (2019), who examined the effect of liquidity on the profitability of European banks after Basel III regulations were implemented, and concluded that liquidity does not significantly impact profitability.

Table 4: Empirical Results: Net Stable Funding Ratio and Profitability

	1	2
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Variables	ROE	ROA
Cutoff	16.184 (12.213)	0.814* (0.486)
ΔNSFR	0.382 (0.265)	0.015 (0.011)
ΔNSFR*Cutoff	-0.437 (0.314)	-0.018 (0.013)
Size	-0.610 (3.716)	-0.305** (0.148)
Funding Structure	-0.243 (0.273)	-0.007 (0.011)
Non-Interest Income	-0.001 (0.321)	0.034*** (0.013)
Overhead Cost	-1.528* (0.909)	-0.264*** (0.036)
Cost-to-Income Ratio	-0.640*** (0.147)	-0.043*** (0.006)
Constant	78.370 (68.187)	9.282*** (2.715)
Observations	168	168
R-Squared	0.217	0.589
Standard errors in parentheses. *** p<0.01, significant at 1%;		
** p<0.05, significant at 5%; * p<0.1, significant at 10%		

Conclusions and Policy Implications

This paper examines the impact of Basel III liquidity requirements, specifically the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR), on the profitability of Nigerian banks. Using regression discontinuity design, data from 14 banks between 2009 and 2020 were analyzed to evaluate how these liquidity standards influence bank performance, particularly return on assets (ROA) and return on equity (ROE). The results reveal that the LCR has a significant positive effect on ROA, indicating that banks with a stronger liquidity buffer are better equipped to improve the profitability of their assets. This implies that maintaining high short-term liquidity allows banks to more effectively manage their operational risks and take advantage of profit-making opportunities. However, the LCR's impact on ROE was found to be statistically insignificant, suggesting that while liquidity helps improve asset performance, it does not necessarily translate into higher equity returns for shareholders. Similarly, the NSFR showed a significant positive impact on ROA, demonstrating that banks with stable long-term funding are more likely to achieve stronger asset profitability. The NSFR ensures that banks maintain stable sources of funding, reducing their vulnerability to liquidity mismatches and enhancing their overall operational stability. Yet, like the LCR, the NSFR's effect on ROE was insignificant, indicating that long-term funding stability does not directly boost returns on equity. This suggests that banks with robust long-term funding strategies benefit from improved asset profitability but face challenges in translating these gains into enhanced shareholder returns. These findings underscore the importance of liquidity management, particularly in ensuring a stable and efficient

operation of banks. However, they also highlight the need for additional factors and strategies to boost equity returns, as liquidity ratios alone may not suffice in driving overall profitability from a shareholder perspective.

In light of these key findings, the policy implications suggest that banks in Nigeria should continue to focus on maintaining strong liquidity positions, as both LCR and NSFR have shown to significantly enhance asset profitability. This is crucial not only for regulatory compliance but also for ensuring the banks are equipped to manage liquidity shocks and capitalize on growth opportunities. Also, given the insignificant effect of LCR and NSFR on ROE, banks should explore other strategies to improve equity returns. These could include better capital allocation, improving operational cost efficiency, and diversifying income streams to boost profitability from non-interest sources by increasing their focus on fee-based services, digital banking, and financial advisory services. By optimizing their cost structures and capital strategies, banks can generate stronger returns for shareholders. Furthermore, the Central Bank of Nigeria (CBN) and other regulatory bodies should maintain a supportive policy framework that encourages banks to uphold liquidity standards while also promoting profitability. Policymakers could consider flexible approaches to liquidity requirements that allow banks to maintain profitability without compromising financial stability. Regular reviews of liquidity requirements should be conducted to align them with the evolving financial landscape and ensure they do not constrain banks' ability to generate shareholder value. Finally, Nigerian banks should integrate liquidity management with broader strategic objectives to maximize both asset and equity returns. Liquidity should be viewed not just as a regulatory necessity but as part of a comprehensive approach to risk and profitability management. Banks should align liquidity policies with strategies for long-term financial sustainability and shareholder value creation.

This study makes several important contributions to the existing body of knowledge on bank profitability and liquidity management in the context of Basel III reforms in Nigeria. First, it provides empirical evidence on the distinct effects of LCR and NSFR on both ROA and ROE, demonstrating how liquidity management affects different dimensions of bank profitability. The findings confirm the critical role of liquidity in driving asset returns, while also highlighting the need for additional measures to boost equity returns, contributing to the global discourse on liquidity and profitability in banking. Second, the use of regression discontinuity design adds methodological rigor to the study, offering a robust approach for assessing the causal impact of Basel III liquidity requirements on bank performance. This approach ensures that the results are reliable and can be used as a basis for policy recommendations and future research. Finally, the study fills a gap in the literature by focusing on the Nigerian banking sector, which operates in an emerging market context with unique challenges. The results provide insights that are particularly relevant for regulators and bank managers in similar economies, where maintaining a balance between liquidity and profitability is critical for financial stability and growth. These contributions pave the way for future research on the relationship between regulatory liquidity requirements and bank performance in other developing economies.

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