Indonesian Interdisciplinary Journal of Sharia Economics (IIJSE) Vol. 7. No. 2 (2024)
e-ISSN: 2621-606X Page: 3416-3440

THE EFFECT OF BASEL III LIQUIDITY, CREDIT RISK, AND MARKET RISK ON THE PROFITABILITY OF COMMERCIAL BANKS IN INDONESIA

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Abstract

This study aims to analyze the effect of Basel III liquidity provisions, credit risk, and market risk on banking profitability in Indonesia. The global financial crisis has hit the banking world several times, showing that the fulfillment of capital requirements is not enough to make banks survive, so the Basel Committee on Banking Supervision initiated Basel III which added provisions regarding banking liquidity, namely Liquidity Coverage Ratio and Net Stable Funding Ratio. Previous research only discussed the effect of the Liquidity Coverage Ratio on banking profitability (Return on Assets and Net Interest Margin), with two control variables Equity to Assets Ratio and Bank Size. This study adds other independent variables of Basel III liquidity provisions (Net Stable Funding Ratio), credit risk (Non-Performing Loan), and market risk (Stock Return Risk). With a sample of 20 conventional banks listed on the IDX for the 5 years (2018-2022), 100 secondary data were obtained from each bank's website. The results of panel data regression with multiple regression analysis show that Net Stable Funding Ratio and Stock Return Risk only has a significant effect on Net Interest Margin; Non-Performing Loan and Bank Size have a significant effect on Return on Assets and Net Interest Margin; Equity to Assets Ratio only has a significant effect on Return on Assets; and Liquidity Coverage Ratio has insignificant effect on both Return on Assets and Net Interest Margin. This study provides implications for bank management and regulators to commit and supervise the NPL level low, and to provide support to increase bank assets.

Keywords: Bank Profitability, Basel III Liquidity Provisions, Credit Risk, Market Risk

INTRODUCTION

The financial crisis that repeatedly impacted the international economy prompted regulators to emphasize banking risk management. In 1975, the Basel Committee on Banking Supervision (BCBS) was formed with members from the G-10 countries, with the main objective of providing guidance related to banking regulations to enhance credibility by strengthening banking supervision worldwide. In response to various crises, including the debt crisis in Latin America during the 1980s, which saw a decline in banking capital ratios over time, the financial crisis in Southeast Asia and South Asia in 1997-1998, and the global financial crisis in 2007-2009, the BCBS issued the Basel Accord.

The Basel Accord is known as Basel I (1988), Basel II (2004), and Basel III (2010). These three accords require banks to have adequate capital in stages according to the level of risk in their portfolios (Pham & Daly, 2020). Basel I and II mandate a minimum capital ratio of 8%. Basel III refined the capital ratio and added three additional ratios: the leverage ratio, the liquidity coverage ratio (LCR), and the net stable funding ratio (NSFR). It also increased the minimum capital ratio requirement from 8% to 10.5%. The 2.5% increase is a mandatory capital conservation buffer created as a corrective measure when banks' capital ratios decline. The four new ratios and capital requirements proposed in the Basel III framework act as constraints on banks and may prevent future financial crises by limiting investment choices and risk strategies (Khan et al., 2022).

Indonesia, an active participant in the forums of the international organizations BCBS (Basel Committee on Banking Supervision) and FSB (Financial Stability Board), has affirmed its commitment to follow the guidelines resulting from these forums. The Financial Services Authority (OJK) is also fully involved in efforts to implement these recommendations while carrying out its functions. In doing so, the OJK will still accommodate domestic developments related to the state of the banking industry. Following up on the implementation of Basel standards in Indonesia, the OJK issued POJK No. 11/POJK.03/2016 regarding Minimum Capital Adequacy of Commercial Banks, which was later updated to POJK No. 34/POJK.02/2016. Adopting and adjusting to the Basel III Reforms standards, the latest regulatory changes are contained in POJK No. 27 of 2022 regarding the Second Amendment to POJK No. 11/POJK.02/2016. The reforms implemented by the Basel Committee (among others through changes from Basel

I to Basel III regulations) represent a step forward in strengthening the liquidity and capitalization of global banks to enhance the stability of the financial sector.

Previous research discusses banking liquidity risk, using the LCR (Liquidity Coverage Ratio) and the LDR (Loan to Deposit Ratio) as independent variables. The study tested their effects on bank profitability, measured using NIM (Net Interest Margin) and ROA (Return on Assets), as well as on credit quality, described by Non-Performing Assets (NPA). The results indicate that LCR significantly affects NIM and NPA but is not significant for ROA. The negative coefficient of LCR with NIM suggests that an increase in LCR level causes a decrease in NIM. Meanwhile, the positive coefficient of LCR with NPA indicates that an increase in LCR level leads to an increase in NPA. Enhancing bank resilience through strengthened liquidity may trigger moral hazard and other risky credit activities, thus increasing NPAs. The NPA value is a measure of banking performance, so an increase in NPA can impact profits, as measured by NIM (Sidhu, Rastogi, Gupte, Rawal, Bhimavarapu, et al., 2022).

Focusing on Basel III liquidity requirements, this study does not use LDR as an independent variable, but instead uses LCR, and examines its effect on banking profitability, namely ROA and NIM. The novelty of this study is the addition of another liquidity requirement from the Basel III Reforms, namely the Net Stable Funding Ratio (NSFR). The NSFR requirement was developed to reduce funding risk in the longer term by requiring banks to finance their activities with sufficient and stable resources. Research conducted on banks in the United States shows that NSFR significantly affects banking performance, with a positive coefficient indicating that an increase in the value of NSFR leads to an increase in bank profitability (Veeramoothoo & Hammoudeh, 2022). The significant effect of NSFR on profitability is also demonstrated by other studies in India, where NSFR significantly affects NIM with a negative coefficient value, meaning that an increase in the value of NSFR impacts profitability, as measured by NIM, negatively (Sidhu, Rastogi, Gupte, Rawal, Agarwal, et al., 2022).

This study also uses independent variables that crucially affect banking performance, namely credit risk, measured by NPL (Non-Performing Loan), and market risk, measured by SMR (Stock Return Risk). Testing credit risk is essential because it is one of the most significant risks faced by banks, given that their main income comes from loans from commercial banks (Ekinci & Poyraz, 2019). The selection of SMR as an independent variable is based on research by (Al-Rdaydeh et al., 2022). In Jordan, which

uses several variables to measure market risk. Two control variables used in previous research by (Sidhu, Rastogi, Gupte, Rawal, Bhimavarapu, et al., 2022) namely the Equity to Assets Ratio (EAR) and Bank Size (BS), are also used in this study.

REVIEW OF LITERATURE

Company's Profitability

Bank profitability can be measured by various indicators, such as Return on Assets (ROA) and Return on Equity (ROE). ROA is calculated as net income divided by assets, and ROE is calculated as net income divided by bank equity. ROA helps assess the bank's administrative ability to utilize its investment and financial resources to earn profits. Banks with higher ROE and ROA have better performance and are financially more stable. Based on research by (Shair et al., 2019), when measuring the ROA of Pakistani banks, it is observed that foreign banks utilize their financial resources more effectively compared to other banks.

In addition to ROA and ROE, another indicator that can be used to measure bank profitability is the Net Interest Margin (NIM), which is an accounting measure of interest income as a share of interest-bearing assets over some time. It identifies the bank's earning capacity through the utilization of all assets and the bank's ability to make the right decisions regarding banking spreads relative to its interest expense (Shair et al., 2019). The dynamics of NIM, which is used to calculate the difference between the interest income received from loans and the interest expense paid to customers who deposit their funds in the bank, indicate the efficiency of financial intermediation.

The NIM figure is also a core banking indicator, contributing approximately 70% to 80% of bank income. A higher NIM ratio correlates with higher bank income (Pham & Daly, 2020). The impact of competition on bank profits can lead to policy intervention. If more profits come from market forces, these conditions can negatively affect customers through lower deposit rates, higher lending rates, and poor-quality financial services (Yao et al., 2018).

The development of the net interest margin (NIM) of banks in Indonesia is an interesting phenomenon to study because the NIM of Indonesian banks is one of the largest in the Southeast Asian region. This is a significant source of the high profitability of large banks in the country. Although a higher NIM indicates higher banking profitability, the NIM level also needs to be kept under control. Competition and even

wars over bank interest rates are common, and excessively high NIM levels can become less attractive to customers.

According to the latest data from OJK in May 2023 (OJK, 2023), Indonesia's banking NIM was 4.88%, placing it second after Cambodia, which had the highest NIM at 5.35%. The Philippines ranked third at 3.56%, while the NIM of Singaporean banks was relatively low at 1.21%. This fact has been highlighted by OJK, and in response, OJK is analyzing policies to control bank NIMs with a focus on improving transparency of lending rate information.

Basel III and Bank Liquidity Risk

Good liquidity management demonstrates a bank's ability to withstand stressful situations. Banks need to measure their liquidity position appropriately and manage it carefully. This is relevant not only to the internal management of the bank but also to supervisors and counterparties who may ultimately bear some of the risks arising from poor liquidity management.

Institutions are free to disclose additional data that they believe will help the market better understand their liquidity position, but the proposed indicators will ensure that at least one measure can be easily compared across institutions (Benink, 2020). Relying solely on capital strength is insufficient to maintain a bank's condition for survival; banks must also have sufficient liquidity. An often-used indicator of banking liquidity in previous studies is the LDR (Loan to Deposit Ratio), which compares total loans given by banks to total deposits (third-party funds) owned by the bank. Another commonly used banking liquidity indicator is the Liquidity Ratio (LR), which refers to short-term liquidity—the ability to meet current obligations compared to long-term obligations.

Current liquidity is crucial for the smooth flow of bank cash. Banks must maintain a proportional liquidity ratio because a lack of liquidity impacts reputation risk, potentially leading to public distrust and increased withdrawals of public funds. Conversely, excessive liquidity can result in suboptimal banking performance and reduced profits (Siddique et al., 2022). This study does not use LDR or LR but instead uses other indicators of liquidity levels that are more specific and based on special agreements between countries established by the BCBS (Basel Committee on Banking Supervision) in Basel III.

The global financial crisis of 2008 provided a valuable lesson in the importance of maintaining minimum standards of measurement. This necessity led to the publication of Basel III by the BCBS in 2010: "International framework for liquidity risk measurement, standards, and monitoring". The regulation aims to control bank liquidity through two new liquidity ratios, namely the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).

The LCR calculation aims to support short-term resilience based on a bank's liquidity risk profile by ensuring that a bank has sufficient High-Quality Liquid Assets (HQLA) to withstand major crisis scenarios over the next 30 calendar days. Meanwhile, NSFR manages funding risk by encouraging banks to shift to more stable and secure funding sources. The NSFR value emphasizes the application of liquidity ratios over a longer period, exceeding 30 calendar days. The implementation of these two Basel III liquidity indicators requires banks to reassess their financial strategies to meet the LCR and NSFR criteria, which, in turn, can affect their performance (Sidhu, Rastogi, Gupte, Rawal, et al., 2022). According to the BCBS, Basel III has two main objectives: to strengthen regulations related to global liquidity and capital by increasing the resilience of the banking sector and to enhance the ability to deal with uncertain conditions.

Liquidity Coverage Ratio (LCR)

LCR has 2 elements, namely: a) Total HQLA stock under stress and b) Total net cash outflows, with calculations based on the following scenario reference:

$$\text{LCR} = \frac{High\ Quality\ Liquid\ Assets}{Net\ Cash\ Outflow} \geq 100\%$$

The numerator of the LCR consists of the stock of HQLA. Banks are required to maintain a stock of unencumbered HQLA to cover the total net cash flow in the next 30 days, especially in stress scenarios. To qualify as HQLA, the asset must be liquid in the market during stress periods and ideally acceptable to the central bank. An asset can be considered HQLA if it can be quickly and easily converted into cash without a significant reduction in value.

The liquidity level of an asset depends on the underlying stress scenario, the face value to be cashed in, as well as the time horizon. Certain types of assets can generate funds without incurring significant impairment, either through outright sale or repo, especially in times of crisis. Assets that can be considered "high quality" are those that can maintain their liquidity, either through sales or repos, even during periods of market

stress and idiosyncratic events. Low-quality assets generally will not pass this test. HQLA assets should qualify as acceptable candidates for central banks to support intraday liquidity needs and overnight liquidity facilities.

Historically, central banks have played a crucial role in providing liquidity to the banking sector, especially during severe crisis conditions. The success of HQLA as central bank eligible adds a layer of confidence, reflecting the assurance that banks holding such assets have reliable liquidity reserves that can be safely utilized during severe crises without posing a substantial risk to the overall stability of the financial system.

The LCR measurement is a minimum requirement that banks must meet. Additionally, banks are expected to conduct their stress tests to analyze the level of liquidity, which should exceed the minimum limit. When conducting internal stress tests, banks are required to develop scenarios covering various potential disruptions to their business activities. These internal stress tests should have a longer time horizon than that required under the LCR. Banks are also expected to submit the results of the stress tests to the supervisory authority. The BCBS requires consistent application of the LCR framework based on the guidance contained in the January 2013 LCR document.

Some previous studies provide results showing a direct proportional relationship between LCR and banking profitability, where higher LCR values correspond to increased banking profitability. Research was conducted on banks in the United States for the period 2010-2017 (Veeramoothoo & Hammoudeh, 2022) as well as 40 banks in 11 developing countries for the period 2011-2016 (Mashamba, 2018). support this notion. In contrast, several other studies show results indicating a negative relationship between LCR values and profitability, where an increase in LCR values suppresses banking profitability. This includes research on 31 banks in India for the period 2010-2019, which serves as the main reference for this study (Sidhu, Rastogi, Gupte, & Bhimavarapu, 2022) and 15 Islamic banks in Malaysia for the period 2009-2020 (Alam et al., 2023).

Net Stable Funding Ratio (NSFR)

The NSFR is one aspect of regulatory reform introduced by the BCBS to reduce funding risk over a longer time horizon compared to the LCR, thereby enhancing banking resilience. The main concept of the NSFR is to require banks to maintain stable funds in line with their administrative account activity and asset mix. This ratio is designed to create a certain level of funding structure to mitigate the risks that may arise from

disruptions to regular funding sources, which may threaten the liquidity of banks and potentially create wider systemic pressures. Through NSFR, banks are empowered to limit excessive reliance on short-term funding sources originating from the wholesale sector.

The NSFR ratio comprises two main components: available stable funding (ASF) and required stable funding (RSF), with the following formula:

$$\text{NSFR} = \frac{Available\ Stable\ Funding}{Required\ Stable\ Funding} \geq 100\%$$

The NSFR ratio needs to be maintained on an ongoing basis. ASF is an integral part of the liabilities and capital that is expected to be available within a timeframe consistent with the NSFR, generally up to 1 year. Additionally, RSF depends on the liquidity characteristics and remaining maturities of the various assets and administrative accounts held by the bank. The NSFR itself consists of calibrations and definitions that have been agreed to be applied internationally, especially in banks with cross-border or international reach.

Supervisors will also consider the results of the assessment of the bank's compliance with the implementation of liquidity risk management principles or Sound Principles. The determination of ASF and RSF values must be adjusted to the stability level of a liability and the liquidity level of an asset, as stipulated in the provisions. Calibration is done by considering stability and liquidity as the main factors. Regulators have a key role in assessing whether individual banks have met these requirements and whether they can manage their funding risks effectively.

The ASF amount is calculated based on the stability of the bank's funding sources, which also includes the contractual maturity of the obligations held by the bank and differences in the propensity of different types of fund providers to withdraw their funds deposited in the bank. When determining the maturity of a liability or equity instrument, investors are assumed to withdraw at the earliest possible time. In the case of funding with options held by banks, supervisory authorities should also consider reputational factors that may limit the ability of banks to exercise such options. If the market expects certain liabilities to be drawn down before the contractual maturity time, both banks and supervisors should assume that such behavior will occur and classify such liabilities as part of the ASF accordingly. The calculation of ASF becomes more contextual and takes into account the nuances of market behavior and investor propensity.

The measurement of RSF is based on the general characteristics of the administrative accounts and the liquidity profile of the assets held by the bank. The RSF factor applied to asset types aims to predict the value of assets that require funding, either because (i) the asset is rolled over, (ii) the asset cannot be liquidated through sale, or (iii) the asset is used as collateral for loan transactions with a period of 1 year without significant costs.

Previous research on NSFR includes studies by (Alam et al., 2023) conducted on 15 Islamic banks in Malaysia for the period 2009-2020, (Veeramoothoo & Hammoudeh, 2022) conducted on banks in the United States for the period 2010-2017, and (Dang, 2021) conducted on 28 banks in Vietnam for the period 2007-2018. These studies showed that NSFR has a positive effect on banking profitability. In contrast, different results were found in research by (Sidhu, Rastogi, Gupte, Rawal, et al., 2022) on 31 banks in India for the period 2010-2021, and (Pak, 2020) on banking in 3 Eurasian Economic Union (EAEU) countries for the period 2008-2017, which indicated that NSFR has a negative effect on banking profitability.

Credit Risk in Banking

Credit risk arises from the inability to repay all or a substantial portion of the principal amount and profit originally granted, or the risk of not being able to recover the profit from the bank's investment. Bank management needs to assess the borrower's financial condition before granting a loan, avoid excessive reliance on collateral, and evaluate the bank's ability to pursue fines against borrowers. According to (Celik, 2019) credit risk analysis can be defined as the concept of assessing risk in credit transactions.

The absence of effective credit risk management leads to banking turmoil and financial crises. Effective management of non-performing exposures or credit risk management in the banking sector has a positive impact on profitability. The effectiveness of such risk management can improve the financial performance of banks and support the development of the banking sector. The importance of credit risk management is reinforced through the growing literature, especially in examining the empirical relationship between credit risk and the monetary benefits of the banking sector (Siddique et al., 2022).

The ratio of bad debts or non-performing loans (NPLs), which measures credit risk, reflects the bank's ability to manage the level of bad debts resulting from debtors' inability to fulfill their obligations to the bank. Credit risk, as reflected in NPLs, is

identified as the main risk in banking. Changes in the value of debt instruments and derivatives are influenced by the diversity of debtors and counterparties and can be evaluated by loans granted by banks. Therefore, bank management must assess the financial condition of the debtor before granting credit, avoid excessive reliance on collateral, and evaluate the bank's ability to collect fines from debtors (Lew & Lau, 2022).

A high NPL ratio indicates that the bank is not managing credit risk well and has many delayed loan payments. Banks are required to provide reserves, known as "provisions," which erode a large portion of profits and thus directly depress financial returns. Banks may be compelled to hire new collection staff, establish new departments, increase legal representation fees, offer faster payment facilities for delinquent customers, or sell loan portfolios below market value to bad debt collection companies. Credit risk also impacts the bank's relationship with customers in terms of the trust of the bank's depositors. An increase in credit risk exposure has a direct impact on the level of deposits and potential bank lending (Aliu & Çollaku, 2021).

Based on the results of hypothesis testing contained in several previous studies, including research on 113 commercial banks in ASEAN countries (Vietnam, Philippines, Thailand, Singapore, and Malaysia) for the period 2016-2020 (Lew, B & Lau, W. 2022), research on banking in Kosovo for the period 2010-2019 (Aliu & Çollaku, 2021), research on 19 commercial banks in India and Pakistan for the period 2009-2018 (Siddique et al., 2022), research on 26 commercial banks in Turkey for the period 2005-2017 (Ekinci & Poyraz, 2019), and research on 14 commercial banks in Nigeria for the period 2008-2017 (Odekina et al., 2019). The results show that NPL significantly and negatively influences banking profitability as measured using dependent variables such as ROA, ROE, and NIM.

Banking Market Risk

Market risk is systematic or inevitable because it is related to market factors that affect the entire company and cannot be eliminated through diversification. Factors such as unexpected inflation, armed conflict, political turmoil, adverse international events, inflation risk, and interest rate risk can pose market risks to a company's performance. Market risk reflects the probability of the occurrence of hazards related to the uncertainty of investment conditions in the portfolio, investment in various securities, and the income of a financial institution due to fluctuations or changes in market conditions related to

factors such as market liquidity, interest rates, asset prices, and so on (Chepkemoi et al., 2019).

According to (Abdellahi et al., 2017), market risk is unavoidable and systematically affects the entire economy in which companies operate every day. Exposure to market risk usually manifests in the form of fluctuations in commodity prices, stock prices, foreign exchange rates, and interest rates. Among these forms of market risk, fluctuations in stock prices have a major influence on the value of market assets and serve as a market-based measure of corporate performance. Therefore, capturing the effects of market risk on firm performance through stock price fluctuations is a practical undertaking, especially during extreme events.

Some indicators can be used to measure market risk. Research on companies in Vietnam (Vo, 2023) use conditional Value at Risk (VAR)utilizes conditional Value at Risk (VAR) as an indicator of market risk and provides results showing that increasing market risk significantly affects profitability (ROE and ROA) with a negative relationship. In other words, the higher the market risk, the greater the impact on decreasing profitability. Research conducted by (Al-Rdaydeh et al., 2022) employed three market risk indicators, namely interest rate volatility, exchange rate uncertainty, and stock volatility risk or Stock Return Risk (SMR), to measure their correlation with bank profitability.

In the study, interest rate volatility was calculated as the natural logarithm of the net interest margin, while exchange rate volatility was calculated as the natural logarithm of foreign exchange gains/losses. The last indicator, stock volatility risk (SMR), is calculated as the natural logarithm of the number of shares outstanding in the industry multiplied by the stock market value at the end of the period. This study will use Stock Return Risk (SMR) as an indicator of market risk.

Conceptual Framework

The following is the framework of this research:

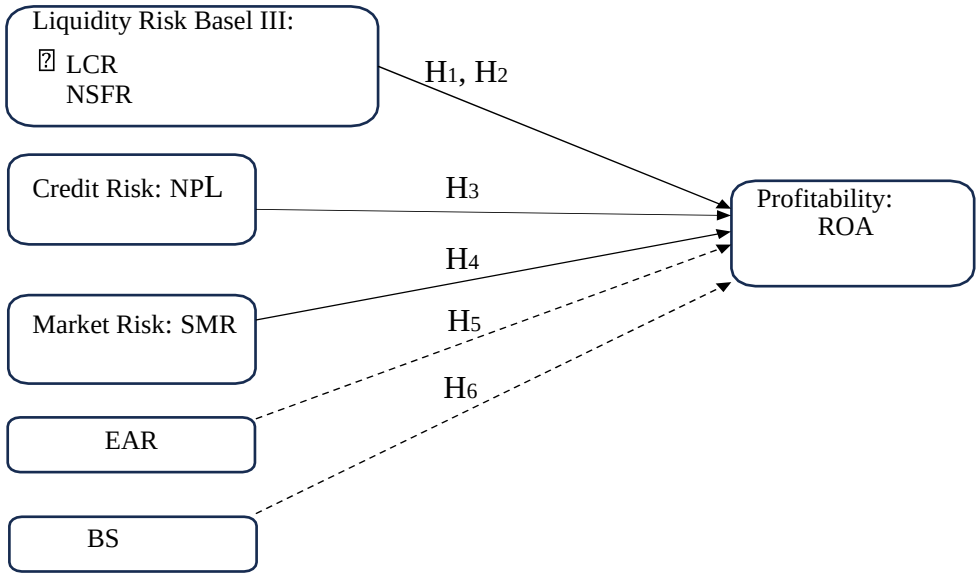

Figure 1
Conceptual Framework

RESEARCH METHOD

This study uses hypothesis testing to examine the effect of independent and control variables on the dependent variable. Four independent variables in this study describe three risks faced by banks: liquidity risk, credit risk, and market risk.

Liquidity risk is measured by Basel III provisions, namely the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). Credit risk is measured by Non-Performing Loans (NPL), and market risk is measured by Stock Market Risk (SMR). The control variables in this study consist of two indicators: the Equity to Assets Ratio (EAR) and Bank Size (BS). The dependent variable in this study is banking profitability, which is measured using two indicators: Return on Assets (ROA) and Net Interest Margin (NIM).

Table 1
Variable Identification and Measurement

$$\text{ROA} = \frac{Net\ Income}{Total\ Assets}$$

Type of Variable	Name of Variable	Symbol	Definition of Variables	Reference
Dependent Variable	Return on Assets	ROA		(Al-Rdaydeh et al., 2022)

	Net Interest Margin	NIM	NIM = $\frac{Net\ Interest\ Income}{Earning\ Assets}$	Gupta & Mahakud, 2020
Independent Variable	Liquidity Coverage Ratio	LCR	LCR = $\frac{High\ Quality\ Liquid\ Assets}{Total\ Cash\ Outflow}$	Alam et al., 2023 Mashamba, 2018
	Net Stable Funding Ratio	NSFR	NSFR = $\frac{Required\ Stable\ Funding}{Available\ Stable\ Funding}$	Papadamou et al., 2021
	Non-Performing Loan	NPL	NPL = $\frac{Non\ Performing\ Loan}{Gross\ Loan}$	Lew & Lau, 2022
	Stock Return Risk	SMR	SMR = *Ln (Number of Shares Outstanding x Shares Market Value)*	Al-Rdaydeh et al., 2022
Control Variable	Equity to Asset Ratio	EAR	EAR = $\frac{Total\ Equity}{Total\ Assets}$	Gazi et.al., 2021
	Bank Size	BS	BS = *Ln of Total Assets*	Sidhu, Rastogi, Gupte,& Bhimavarapu, 2022

The data used in this study is panel data, which combines cross-sectional and time series data. Panel data regression analysis was carried out using the Eviews 12 tool. The sampling method used in this study was purposive sampling. This method is a sampling technique based on specific considerations and criteria. The following table outlines the sampling criteria used in this study:

Table 2
Sampling Criteria

No.	Information	Total
1	KBMI 4, 3, 2 conventional commercial banks, or banks with majority foreign ownership	52
2	Banks that meet criterion 1, which are not listed on the Indonesia Stock Exchange for the period 2018-2022	-16
3	Banks that meet criteria 1 and are listed on the Indonesia Stock Exchange (IDX), do not have complete LCR and NSFR Publication Reports for the period 2018-2022.	-16
	Number of Banks eligible for sampling	20
	Total research data	100

Model Conformance Test

Chow Test

Table 3
Chow Test Results

Model	Dependent	Chi-square	Prob	Decision
1	ROA	73.024586	0.0000	Declined H0, Fixed Effect selected
2	NIM	139.034198	0.0000	Declined H0, Fixed Effect selected

Source: Output e-views 12

Based on the Chow test table, it shows that the cross-section Chi-square probability value in models 1 and 2 is less than < 0.05, so H0 is rejected so that the model used is Fixed effect. If the selected model is a model of Fixed effect, then further testing is required with the Hausman test to test whether to use the fixed effect or random effect model.

Hausman Test

Table 4
Hausman Test Results

Model	Dependent	Chi-square	Prob	Decision
1	ROA	7.788098	0.2540	Accepted H0, Random Effect selected
2	NIM	15.104995	0.0195	Declined H0, Fixed Effect selected

Source: Output e-views 12

Based on the Hausman test results table, the results of model 1 show that the cross-section Statistic probabilistic value is 0.5027 > 0.05, then H0 is accepted so that the model used is the Random effect model. Based on the table of Hausman test results, the results of model 2 show that the cross-section Statistic probabilistic value is 0.0195 <0.05, so the decision that can be obtained is that H0 is rejected so that the model used is the Fixed effect model.

Lagrange Multiplier Test

Table 5
Lagrange Multiplier Test Results

Model	Dependent	Chi-square	Prob	Decision
1	ROA	19.04450	0.0000	Declined H0, Random Effect selected

Source: Output e-views 12

Based on the table of Lagrange Multiplier Test (LM-Test) results, the results of model 1 show that the cross-section Statistic probability value of 0.0000 < 0.05 (H0 is rejected) so the model used is the Random effect model.

Goodness of Fit Test (Adjusted R2)

Table 6
Goodness of Fit Test Results

Model	Dependent	R2	Adjusted R2
1	ROA	0.523824	0.493103
2	NIM	0.936237	0.914696

Source: Output e-views

Based on the goodness of fit test results for model 1, the adjusted R-squared value is 0.493103, indicating that the independent variables (LCR, NSFR, NPL, and SMR) and the control variables (EAR and BS) explain 49.3103% of the variation in ROA. The remaining 50.6897% is influenced by other factors not included in this model.

For model 2, the goodness of fit test results show an adjusted R-squared value of 0.914696. This means that the independent variables (LCR, NSFR, NPL, and SMR) and the control variables (EAR and BS) explain 91.4696% of the variation in NIM. The remaining 8.5304% is influenced by other factors not included in this model.

Simultaneous Test (F-Test)

Table 7
F Test Results

Model	Dependent	F-Statistic	Prob	Decision
1	ROA	17.05097	0.000000	Declined H0
2	NIM	43.46209	0.002823	Declined H0

Source: Output e-views 12

Based on the test results, the F-statistical probability in model 1 produces a value of 0.000000 < 0.05 and in model 2 of 0.002823 <0.05. Thus, the results of the analysis in this study indicate that together the independent variables, namely LCR, NSFR, NPL and SMR as well as the control variables, namely EAR and BS, influence the dependent variables, namely ROA and NIM so that the regression model is feasible to use in this study.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 8
Descriptive Statistical Analysis Results

	ROA	NIM	LCR	NSFR	NPL	SMR	EAR	BS
Mean	0.010973	0.064144	2.227959	1.334734	0.030825	30.63899	0.165202	32.70700
Median	0.011872	0.065304	1.955304	1.290842	0.027992	30.73429	0.149834	32.83193
Maximum	0.031343	0.140899	9.414716	3.075684	0.111573	34.59137	0.549871	35.22819
Minimum	-0.029895	0.003031	0.879555	0.858563	0.008131	23.57827	0.055336	28.94511
Std. Dev.	0.010963	0.028373	1.320437	0.310846	0.018920	2.015783	0.071601	1.463117

Source: Output e-views 12

Multiple Linear Regression

The results of multiple regression statistical processing produce the following regression model equation:

Regression Equation Model 1:

ROAit = -0.125564 - 0.000838 LCRit - 0.006908 NSFRit - 0.267378 NPLit + 0.000586 SMRit + 0.075353 EARit + 0.003836 BSit

Model 2 Regression Equation:

NIMit = -8.066418 - 0.057354 LCRit + 0.416338 NSFRit - 6.314022 NPLit - 0.076524 SMRit + 0.721130 EARit + 0.218707 BSit

Hypothesis Test (T Test)

Table 9
Regression Analysis Results

Independent Variable	Dependent Variable: Return on Asset			Dependent Variable: Net Interest Margin		
	Coefficient	Prob.	Conclusion	Coefficient	Prob.	Conclusion
Konstanta	-0.125564	-	-	-8.066418	-	-
LCR	-0.000838	0.4149	Not Significant	-0.057354	0.1093	Not Significant
NSFR	-0.006908	0.2359	Not Significant	0.416338	0.0078	Positive Significant
NPL	-0.267378	0.0065	Negative Significant	-6.314022	0.0001	Negative Significant
SMR	0.000586	0.4012	Not Significant	-0.076524	0.0000	Negative Significant
EAR	0.075353	0.0000	Positive Significant	0.721130	0.2555	Not Significant
BS	0.003836	0.0001	Positive Significant	0.218707	0.0052	Positive Significant

Source: Output e-views 12

Discussion

H1: There is an effect of LCR on banking profitability as measured by ROA and NIM

Based on Table 9 for model 1, the analysis results show that LCR has no significant effect on ROA, with a probability value of 0.4149 and a coefficient value of -0.000838. This finding contrasts with the research conducted by (Alam, et al. 2023) and (Mashamba. 2018) which state that LCR significantly affects bank profitability as measured by ROA. However, it aligns with the results of research conducted by (Sidhu, et al. 2022) which found that LCR does not significantly affect ROA. The latter study suggests that liquidity has a greater impact on the spread between interest income and interest expense, as described by NIM.

The calculation of ROA involves not only interest income and expenses but also other banking operating income and expenses. The components that make up the LCR value are related to assets and liabilities directly tied to the formation of interest income and expenses, thus not significantly affecting the overall level of banking returns outside of interest income and expenses. This is indicated by the insignificance of the probability value of LCR on ROA.

Based on Table 9 for Model 2, the analysis results show that LCR has no significant effect on NIM, with a probability value of 0.1093 and a coefficient value of -0.057354. This finding contradicts the research conducted by (Sidhu, et al. 2022) but aligns with the results of research conducted by (Golubeva, et al. 2019). The Basel III liquidity measure, LCR, appears to be an insignificant contributor to all return proxies, warranting further investigation.

In Europe, the regulation to disclose the LCR liquidity measure is relatively new, and banks may employ slightly different methods in calculating this liquidity measure, affecting its impact on profitability. Similarly, in Indonesia, a developing country, the LCR requirement is also new. There may be variations in how banks estimate this ratio, influencing the results on how LCR impacts the profitability proxy. Based on the results of this study, H1 is rejected.

H2 : There is an effect of NSFR on banking profitability as measured by ROA and NIM

Based on Table 9 for model 1, the analysis results show that NSFR has no significant effect on ROA, with a probability value of 0.2359 and a coefficient value of -0.006908. Therefore, H2 with the dependent variable ROA is rejected. This finding

contrasts with research conducted by (Alam et al. 2023), (Dang. 2021) dan (Pak. 2020). Which states that NSFR significantly affects bank profitability as measured by ROA.

The results of this study align with research conducted by (Sidhu, et al. 2022). which shows that liquidity, as measured by NSFR, impacts the spread between interest income and interest expense described by NIM, but does not significantly affect ROA. The calculation of ROA includes not only the spread between interest income and expense but also the bank's rate of return from other sources of income and expense.

Based on Table 9 for model 2, the analysis results show a significant effect of NSFR on NIM, with a probability value of 0.0078 and a coefficient value of 0.416338. Therefore, H2 with the dependent variable NIM is accepted. The significant effect of NSFR on NIM aligns with research conducted by (Sidhu, et al. 2022), (Pak. 2020), (Alam, et al. 2023), and (Dang (2021). However, research by Sidhu (2022) and Pak (2020) indicates a negative coefficient value, where an increase in NSFR causes a decrease in NIM, and a decrease in NSFR causes an increase in NIM. According to these studies, the implementation of NSFR leads to a decrease in bank NIM due to narrower spreads and maturity mismatches.

With a positive coefficient value, the results of this study indicate that in banks in Indonesia, an increase in NSFR causes an increase in NIM, and vice versa. These results are consistent with research by Alam, et al (2023) conducted on banks in Malaysia and research by Dang (2021) on banks in Vietnam during the 2007-2018 period. A higher NSFR increases bank NIM by reducing funding costs. The Net Stable Funding Ratio (NSFR) improves bank performance by increasing stable and secure funding sources.

H3 : There is an effect of NPL on banking profitability as measured by ROA and NIM

Based on Table 9 for model 1, the analysis results show a significant effect of NPL on ROA, with a probability value of 0.0065 and a coefficient value of -0.267378. The negative coefficient indicates that banks with high levels of bad debts experience decreased profitability. This finding is consistent with research conducted by (Lew & Lau. 2022) on banking in ASEAN countries, (Collaku & Aliu. 2021) on banking in Kosovo, (Siddique, et al. 2020) on banking in India and Pakistan, and research by (Okedina, et al. 2019) on banking in Nigeria.

These studies generally state that NPLs are identified as the main risk faced by banks. The inability to manage credit risk properly causes banks to struggle in managing

their fund turnover. A high NPL rate indicates that the bank's function as a profit-making intermediary institution is not working optimally.

In periods of uncertainty, where there is an increase in defaults and NPL levels, banks should proactively implement efficient provisioning and risk management procedures. It is beneficial to evaluate and effectively assist distressed borrowers wherever possible for the good of all stakeholders. Regulators can develop risk management guidelines and enforce appropriate supervisory mechanisms for a healthier banking system (Lew & Lau. 2022).

Based on Table 9 for model 2, the analysis results show a significant effect of NPL on NIM, with a probability value of 0.0001 and a coefficient value of -6.3142022. This finding aligns with research conducted by (Gupta & Mahakud. 2020) on banking in India, which states that the impact of credit risk, as measured by NPL, is significantly negative. Higher NPLs lead to an increase in the level of risk, adversely affecting the profitability of banks in India.

Poor credit assessment capabilities of lenders, diversion of resources to unrelated businesses, or fraud by borrowers due to a lack of due diligence and incompetence in the monitoring process may contribute to bad debts in banks, resulting in decreased profitability. Similarly, research by (Abdellahi, et al. 2017) on banking in Iran also indicates that NPL significantly affects NIM with a negative coefficient. Based on the results of this study, H3 is accepted.

H4 : There is an effect of SMR on banking profitability as measured by ROA and NIM.

Based on Table 9 for model 1, the analysis results show that there is no significant effect of SMR on ROA, with a probability value of 0.4012 and a coefficient value of 0.000586. Therefore, H4 with the dependent variable ROA is rejected. This finding contradicts the research by (Al- Rdaydeh, et al. 2022) which found that market risk, as measured by SMR, significantly affects bank profitability as measured by ROA and ROE. However, it aligns with the research by (Abdellahi, et al. 2017) on banking in Iran, which also shows that market risk measured using SMR does not significantly affect bank profitability as measured by ROA.

The insignificant effect of SMR on ROA could be because SMR is calculated by multiplying the number of shares outstanding by the share price. During the research period, the number of shares outstanding in banks did not show much change. The

insignificance of SMR on ROA may also indicate that, in Indonesian banks, the level of market risk measured using SMR is not directly related to ROA. The relationship may become significant with the inclusion of an indicator that acts as a mediating or moderating variable. Future studies could consider using other dependent variables such as Return on Equity (ROE) or Return on Investment (ROI).

Based on Table 9 for model 2, the analysis results show that there is a significant effect of SMR on NIM, with a probability value of 0.0000 and a coefficient value of -0.076524. Therefore, H4 with the dependent variable NIM is accepted. The significant effect of SMR on NIM aligns with the findings of (Al-Rdaydeh, et al. 2022) and (Abdellahi, et al. 2017). The negative coefficient indicates a negative relationship between market risk and NIM, suggesting that negative market returns may be influencing this relationship. When market returns are positive, there is typically a positive relationship between beta and return; conversely, when market returns are negative, the beta and return relationship is negative (Abdellahi, et al. 2017).

This outcome is unexpected, as under normal conditions, the variation in market returns should be positive, leading to a positive relationship between volatility and returns. The negative relationship between SMR and NIM could be because Indonesian banks with high stock prices tend to have relatively low NIM, and vice versa. Another possible explanation for the negative coefficient is that banks with high NIM often distribute large portions of their profits as dividends. This reduces the value of retained earnings, which cannot be optimally utilized as additional equity to support bank activities, including lending, ultimately affecting profitability. These conditions illustrate that SMR has a negative effect on bank profitability as measured by NIM.

H5 : There is an effect of EAR on banking profitability as measured by ROA and NIM

Based on Table 9 for model 1, the analysis results show a significant effect of EAR on ROA, with a probability value of 0.0000 and a coefficient value of 0.075353. Therefore, H5 with the dependent variable ROA is accepted. This finding aligns with research conducted by (Gazi, et al. 2021) on banking in Bangladesh and research by (Jadah, et al. 2020) on banking in Iraq, both of which show that EAR positively and significantly affects profitability as measured by ROA. According to these studies, a higher amount of equity reduces capital risk.

A low capital ratio can affect public confidence in the bank and its safety. Generally, there are many advantages to a large equity size, one of which is the ability to provide numerous services to bank customers. If managed properly, this can increase bank profitability. A high proportion of capital to assets also increases the return on assets. Bank capital is essential for the bank's internal needs, including operational activities that generate operating income and other investment activities. The positive effect of EAR on bank profitability is also influenced by efficient capital structure management.

Based on Table 9 for model 2, the analysis results show that there is no significant effect of EAR on NIM, with a probability value of 0.2555 and a coefficient value of 0.721130. Therefore, H5 with the dependent variable NIM is rejected. This finding does not align with the results of research conducted by (Sidhu, et al. 2022) on banking in India.

The results of this study indicate that EAR does not significantly affect NIM, which is consistent with research conducted by (Yuan, et al. 2022) on banking in Bangladesh. The insignificance of EAR on bank profitability as measured by NIM may suggest that, in Indonesia, the proportion of external capital structure compared to internal capital is not directly related to net interest income at the bank. The relationship between EAR and NIM may occur through a more complex mechanism, such as through mediating or moderating variables.

Another reason for the insignificant effect of EAR on NIM could be the differing dividend policies of each bank. Some banks implement a large retained earnings policy, allowing for additional capital allocation to lending. Conversely, other banks distribute dividends in large portions, resulting in no additional equity to allocate to lending.

H6 : There is an effect of BS on banking profitability as measured by ROA and NIM

Based on Table 9 in model 1, the analysis results show a significant effect of BS on ROA with a probability value of 0.0001 and a coefficient value of 0.003836. This aligns with the results of research by (My & My. 2022) on banking in Vietnam and by (Shaik & Sharma. 2021) on banking in Saudi Arabia. Banks with larger asset holdings are better able to increase their customer base, making it easier to mobilize capital.

With larger assets, a bank can reduce operating costs by utilizing economies of scale, attracting more customers, and improving lending activities. Research in South Asia (Siddique, et al. 2020) and di Turki (Ekinci & Poyraz. 2019) which uses bank size as a control variable, also shows similar results: bank size has a significant positive effect

on financial performance (ROA and ROE). Banks with larger assets can invest more, diversify their portfolios, reduce risk, and increase profits.

Based on Table 9 in Model 2, the analysis results show a significant effect of BS on NIM with a probability value of 0.0052 and a coefficient value of 0.218707. This is consistent with the research (Gupta & Mahakud. 2020) on banking in India, which found that bank size positively affects NIM. The assets owned by a bank can be an indicator of economies of scale, leading to lower overhead costs. Large banks are in a more favorable condition, allowing them to achieve better financial performance compared to small banks. In Indonesia, banks are encouraged to conduct mergers and acquisitions of smaller banks to achieve a leaner industry structure, indicated by fewer banks with larger assets, higher banking industry concentration, and more intense competition. Based on the results of this study, H6 is accepted.

CONCLUSION

The conclusions that can be drawn are as follows: a) Basel III liquidity provisions, namely LCR, do not significantly affect banking profitability (ROA and NIM) in Indonesia; b) Basel III liquidity requirements, namely NSFR, significantly positively affect NIM but do not significantly affect ROA; c) Credit risk, namely NPL, significantly affects banking profitability in Indonesia (ROA and NIM), with a negative relationship; d) Market risk i.e. SMR significantly negatively affects NIM, but not significantly affect ROA; e) Bank capital, EAR, significantly positively affects ROA, but not significantly affects NIM; f) Bank asset size, BS, significantly positively affects banking profitability in Indonesia (ROA and NIM).

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