

Credit Risk and Capital as Moderation of Liquidity on Bank Profitability

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Abstract

Purpose – The aim of the research is to investigate how liquidity affects bank profitability in conditions where there is a trade-off between liquidity and bank profitability. Credit risk and capital are related to bank liquidity. The higher the credit risk, the bank needs to provide reserve funds. When liquidity decreases, it can be increased with additional capital

Methodology – This research looked at 45 commercial banks operating in Indonesia in the 2017-2022 period. Interaction term is measured by the absolute difference of variables.

Findings – The test results show that there is a trade-off between liquidity and profitability, especially in banks with high capital.

Originality – This research uses credit risk and bank capital as moderating variables in the case of banking in Indonesia.

1. Introduction

Banks play an important role in the economy as financial intermediary institutions. In managing its assets and liabilities, banks face various kinds of risks. Banks must manage liquidity risk in order to fulfil all their obligations to depositors, while in disbursing loans banks face credit risk. Asset and liability management is the most important decision making in maximizing bank value (Novickytė & Petraitytė, 2014). Banks make efforts to manage and control the gap between assets and liabilities in the same period, including gaps in terms of amount of funds, interest rates,

rate sensitivity and maturity. Previous research found that asset management and liquidity have an impact on bank profitability (Al-Shubiri, 2010).

Several previous studies have studied the influence of internal bank factors on profitability. Credit risk, liquidity risk and capital adequacy were found to have a significant effect on the profitability of commercial banks in Jordan (Saleh & Abu Afifa, 2020). The interaction between credit risk and liquidity risk was found to have a significant effect on the profitability of banks in Middle Eastern and North African countries (Abdelaziz et al., 2022). Liquidity creation was also found to be positively related to bank profitability in the US (Duan & Niu, 2020). These studies show the importance of managing liquidity in improving bank performance.

In managing bank funds there is a trade-off between liquidity and profitability. Placing funds in liquid assets provides low returns, and vice versa. One of the objectives of liquidity management is to maintain the bank's position in accordance with the provisions set by the Central Bank. Banking is a highly regulated industry. Commercial banks are required to maintain liquidity, capital adequacy and monitor credit risk in accordance with regulations. These regulations limit banks in pursuing profits. Consideration of factors that drive bank profitability is an important tool for banking regulators because it supports prudential analysis (Batten & Vo, 2019).

Table 1 shows several indicators of Indonesian banking performance 2017-2022. It can be seen that several indicators such as return on assets (ROA), Loan to Deposit Ratio (LDR), and experienced a decline in 2019 and 2020, while non-performing loans (NPL) actually increased. A decrease in credit quality is followed by a decrease in LDR and an increase. Capital Adequacy Ratio (CAR) as an effort to strengthen liquidity in times of crisis. Bank performance has only begun to recover since 2021, as shown by NPLs starting to decline and ROA increasing, as well as increasingly higher liquidity.

Table 1. Banking Performance Indicators 2017-2022

Performance Indicators	year					
	2017	2018	2019	2020	2021	2022
ROA	2,45	2,55	2,47	1,59	1,85	2,45
CAR	23,18	22,97	23,40	23,89	25,66	25,62
LDR	90,04	94,78	94,43	82,54	77,49	78,98
NPL	2,59	2,37	2,53	3,06	3,00	2,44

Source: Indonesian Banking Statistics 2017-2022

Previous research found that liquidity has a negative effect on profitability (Dang, 2019a). Maintaining high liquidity limits profitable investments. Other research finds the opposite result that liquidity has a positive impact on profitability (Adelopo et al., 2022). The use of liquidity in Asian countries is different from the United States. Liquidity has a positive impact on profitability in Asian banks, while liquidity has a negative impact on the profitability of American commercial banks in the post-crisis period (Abbas et al., 2019). Banks that have a higher amount of liquid assets produce greater profitability because higher liquid assets reduce liquidity costs and bank funding costs (Graham & Bordeleau, 2010). Other researchers actually found that liquidity did not have a significant effect on bank profitability (Shrestha, 2018). The differences in previous research results show that there is a research gap between the relationship between liquidity and bank profitability.

The central bank controls banking liquidity in Indonesia by regulating the minimum statutory reserve (GWM) in Bank Indonesia Regulation no. 17/11/PBI/2015. GWM is the balance of bank demand deposits at Bank Indonesia. The higher the GWM, the higher the bank's liquidity. One of the regulatory backgrounds is to encourage economic growth through banking credit growth, adjustments are made to the GWM policy through calculating the loan to deposit ratio. In this regulation, the components of securities issued by banks are included in the calculation of the Loan to Deposit Ratio (LDR) and then the term LDR is changed to loan to funding ratio (LFR). The target loan to funding ratio (LFR) range set is between 78 – 92%. There is a disincentive for banks with LFR outside the target range in the form of additional mandatory current account balances at the central bank. On the other hand, there are incentives for banks with large capital, low non-performing loans.

Previous research finds evidence that tightening liquidity regulations causes banks to shrink their balance sheets, or reduce the amount of loans to the non-financial sector (Banerjee & Mio, 2018). This means that the bank is willing to accept the consequences of LFR outside the target. For this reason, banks must increase capital and improve asset quality to remain in accordance with regulations. Empirical findings on the impact of these regulations show that there is an interaction between liquidity and capital and bank asset quality. The main assets of banks are in the form of credit. One of the financial ratios for assessing productive assets is Non-Performing Loans (NPL). The higher the NPL means the higher the number of non-performing loans relative to total bank credit. Based on this, in this research the capital adequacy and NPL variables are included as moderating variables. This is also supported by findings in developing countries showing that capital strength and asset quality are the main drivers of profitability (Robin et al., 2018).

Previous research found that liquidity has a negative effect on profitability (Dang, 2019b). Maintaining high liquidity limits profitable investments. Liquidity risk has a negative impact on bank performance in a market-based financial system. Compared to the costs of attracting deposits in a bank-based financial system, funding through financial markets in a market-based financial system is expensive (Chen et al., 2018). The loan to deposit ratio has a negative effect on the financial performance of banks in Botswana (Sathyamoorthi et al., 2020), meaning that the less liquid a bank is, the less its performance will decrease. On the other hand, the more liquid the bank's performance, the better.

Other research finds the opposite result, that liquidity actually has a positive effect on bank financial performance. Due to higher funding costs to obtain liquidity, liquidity risk is considered a factor that reduces bank profitability; however, liquidity risk indicates an improvement in bank performance in relation to the bank's net interest margin. Other research using the liquid ratio measure found that liquidity also has a positive impact on profitability (Suliman Alshatti, 2014). Banks that have a higher amount of liquid assets can reduce liquidity costs and bank funding costs, so they are able to generate higher profits (Graham & Bordeleau, 2010).

H1: Liquidity has a significant effect on bank profitability

Previous research found that capital ratios have a significant effect on profitability (Suliman Alshatti, 2014). High capital increases efficiency thereby increasing bank profitability (Bitar et al., 2018). This efficiency comes from reducing several types of costs, including external funding costs, agency costs and bankruptcy costs. Banks with large capital require less external funding so that funding costs are low and profits are high (Robin et al., 2018). Reducing funding costs or reducing the need for external funding will improve bank performance (Chen et al., 2018).

Investing higher capital makes bank owners and managers more careful in choosing investments. A higher capital ratio can also align the interests of shareholders and bank depositors, thereby reducing agency problems and ultimately reducing costs thereby increasing bank efficiency (Bitar et al., 2018). Banks with a healthy capital position have more flexibility in dealing with problems due to unexpected losses (Chen et al., 2018). Banks with large capital can carry out their activities more freely because they face lower bankruptcy costs. Banks with higher capital ratios are able to establish higher reserves, to protect against potential credit default risks.

H2: Capital has a significant effect on bank profitability

Bank loan distribution is the main element in total bank assets that generate interest income, therefore the credit distribution factor is very important in determining bank profitability. Although lending is a source of income, there are risks associated with this operation due to the possibility of customer default which is referred to as credit risk. An increase in bad loans will be detrimental to banks and can even cause bank failure. In addition, when borrowers cannot fulfil their commitments, banks become less flexible, stricter, and more restrictive in lending, thereby reducing interest income and consequently reducing banking profitability (Abdelaziz et al., 2022). Banks with high levels of bad loans must provide high reserves which can reduce the bank's ability to earn profits. The negative influence of credit risk on profitability has been widely documented by previous researchers (Abdelaziz et al., 2022; Dang, 2019b).

H3: Credit risk has a negative effect on bank profitability

Banks that have more liquid assets face lower credit risk but generate less profit. There is a trade-off between returns and risk as banks attempt to adjust their liquidity positions (Dang, 2019b). Increasing liquidity by reducing bank investment in credit results in less credit portfolio risk. From an emerging markets perspective, loan expansion often gives rise to negative signals in the form of moral hazard or agency problems, which reduce credit quality (Dang, 2019a). Bank profits are influenced by adjusting bank management behavior according to the level of risk. For example, banks with higher credit risk adjust the level of their liquid assets to a higher level, thereby negatively impacting the profitability of the credit portfolio. On the other hand, a low level of credit risk means banks do not need to worry too much about their liquidity position so they can expand investment in other assets that generate high profits.

H4: Credit risk influences the relationship between liquidity and bank profitability

Banks with strong capital tend to have asset portfolios that are less risky, but produce less profit. Excessive concentration on capital requirements can cause banks to ignore the importance of liquidity management (Dang, 2019b). If liquidity decreases, banks must increase capital to remain in compliance with regulations. These findings are in line that capital ratios are less effective in streamlining costs for highly liquid banks (Bitar et al., 2018). Higher capital, combined with higher liquidity, has an adverse impact on bank activities and reduces bank efficiency and profitability (Bitar et al., 2018). These findings of previous research indicate a trade-off between the benefits of financial stability caused by capital provision and the benefits of liquidity creation (Horváth et al., 2014).

H5: Capital influences the relationship between liquidity and bank profitability

2. Research Method

The research sample is all commercial banks operating in Indonesia for the period 2017 – 2022. The number of samples is 45. The data source is bank publication reports. Based on Indonesian regulations, all operating banks are required to publish quarterly and annual financial reports. Bank publication reports include bank performance ratios, this has been regulated in the Circular Letter of the Financial Services Authority of the Republic of Indonesia Number 9 /SEOJK.03/2020 concerning Transparency and Publication of Conventional Commercial Bank Reports. The letter also regulates the formula for calculating financial ratios which are standard for all banks which are also used as measurements for the variables in this research.

Research variables consist of dependent variables, independent variables and moderating variables. The dependent variable is bank profitability as measured by Return on Assets (ROA). The independent variable is liquidity which is measured by the Loan to Deposit Ratio (LDR). The moderating variable is credit risk as measured by non-performing loan net (NPLnet) and capital as measured by the Capital Adequacy Ratio (CAR). Variable measurements and their references are shown in Table 2.

Table 2. Variable Measurement

Variable	Measurement	Reference
Profitability	$ROA = \frac{\text{earning before tax}}{\text{Average total assets}}$	(Chen et al., 2018; Robin et al., 2018; Shrestha, 2018; Sulieman Alshatti, 2014)
Liquidity	$LDR = \frac{\text{credit}}{\text{third - party funds}}$	(Sathyamoorthi et al., 2020; Shrestha, 2018)
Capital	$CAR = \frac{\text{capita; l}}{\text{risk - weighted assets}}$	(Bitar et al., 2018; Dang, 2019b)
Credit risk	$NPL_{net} = \frac{NPL - \text{Provision for Impairment Losses}}{\text{Total credit}}$	(Abdelaziz et al., 2022; Bitar et al., 2018; Dang, 2019b)

Source: previous research

This research uses two moderating variables. The two moderating variables interact with the independent variables, so this research uses Additive Multiple Moderation (Hayes, 2022). For example, the variable X is also a function of more than one variable simultaneously, such as W and Z.

$$Y = i_Y + f(W, Z)X + b_2W + b_3Z + eY \dots\dots\dots (1)$$

For example, the additive linear function is as follows

$$f(W, Z) = b_1 + b_4W + b_5Z \dots\dots\dots (2)$$

which if substituted into equation (1) becomes

$$Y = i_Y + (b_1 + b_4W + b_5Z)X + b_2W + b_3Z + eY \dots\dots\dots (3)$$

The main model of this research is equation 3. However, previously a regression was also carried out on equation 1, where the interaction effect of W and Z on X was not included. This procedure is called hierarchical regression or hierarchical variable entry (Hayes, 2022). The purpose of using this method is to determine whether the effect of X that depends on W produces a better fitting model than a model where the effect of X does not depend on W.

In this study, X is LDR, W is NPL and Z is NPL. Thus equations 1 and 3 can be rewritten into research models 1 and 2 as follows:

$$\text{Model 1: ROA} = i_Y + b_1 \text{LDR} + b_2 \text{NPL} + b_3 \text{CAR} + e_Y$$

$$\text{Model 2: ROA} = i_Y + b_1 \text{ZLDR} + b_2 \text{ZNPL} + b_3 \text{ZCAR} + b_4 | \text{ZNPL-ZLDR} | + b_5 | \text{ZCAR-ZLDR} | + e_Y$$

Where,

ROA is Return on Assets

ZLDR is normalized LDR ($|LDR_i - \overline{LDR}| / \sigma_{LDR}$)

ZNPL is normalized NPL ($|NPL_i - \overline{NPL}| / \sigma_{NPL}$)

ZCAR is the normalized CAR ($|CAR - \overline{CAR}| / \sigma_{CAR}$)

$| \text{ZNPL-ZLDR} |$ is the interaction between NPL and LDR, namely the absolute difference between ZNPL and ZLDR

$| \text{ZCAR-ZLDR} |$ is the interaction between CAR and LDR, namely the absolute difference between ZCAR and ZLDR

The interaction model used is difference interaction. The frequently used multiplicative interaction term does not provide a good measure of this condition. Although, multiplicative interactions may work for extreme values, they do not work well across a range of values (Brownell, 1982; Frucot & Shearon, 1991). The rationalization of this interaction is as follows: The combination of high credit risk with low liquidity will produce large absolute differences, as will the combination of low credit risk with high liquidity. The combination of high capital with low liquidity will produce large absolute differences, as will the combination of low capital with high liquidity. Normalizing the LDR, NPL and CAR variables aims to determine the absolute difference for the moderating variable. Regression of the LDR, NPL and CAR variables as independent variables using normalized variable values or using non-normalized variable values will give the same linear regression coefficient.

3. Results and Discussions

Descriptive statistics of the research variables can be seen in Table 3. On average, the loan-to-deposit ratio of banks in Indonesia is still in line with the range determined by the regulator. The lowest LDR belonged to Bank Capital Indonesia in 2021. Based on the management report in Bank Capital Indonesia's 2021 annual report, the decline in credit balances is in line with the Bank's transformation plan to focus on retirement and retail credit. Meanwhile, the highest LDR is owned by Bank Bisnis Internasional in 2022. According to the management report in the bank's annual report, the LDR Ratio can be greater than the Maximum LDR Limit provisions according to Bank Indonesia because the Bank has funds from its own capital so that lending is greater than collecting funds from third party.

Average banking credit in Indonesia is quite healthy with an average net NPL of 1.664%. Banks will be intensively monitored by the Financial Services Authority if net NPL is above 5%. The lowest NPL is owned by Bank Amar Indonesia. In fact, in 2018 the bank's NPL was negative. This can happen because the NPL amount is reduced by the amount of reserves for impairment losses in the overall credit value. If reserves are greater than the net NPL can be negative. Meanwhile, Bank Neo Commerce had the highest NPL in 2018. This figure is the only net NPL above 5% from all observations. However, Neo bank was able to reduce net NPL to 1.63% in the following year.

OJK regulations require capital to be set at a minimum of 9% -14% of assets in accordance with the Risk Profile Level. Descriptive statistics of capital variables measured by CAR show that

all banks have met minimum capital obligations. The lowest CAR in observations was owned by Bank Bukopin in 2017. Meanwhile, the highest CAR was by Bank Bisnis Internasional in 2022. As has been mentioned, Bank Bisnis Indonesia has high capital, making it possible to provide greater credit than collecting funds from third parties.

Average ROA is 0.62%. Several banks suffered losses during the observation period, with the lowest ROA belonging to Bank Jago in 2019 with an ROA of -15.89%. Bank Jago is one of the digital banks in Indonesia. This bank has only recorded positive ROA starting in 2021. Of the 270 observations, 39 banks experienced negative ROA, while 231 observations experienced positive ROA. Meanwhile, the highest ROA was experienced by Bank Bisnis International in 2021.

Table 3. Descriptive statistics

Variable	Mean	Median	Min	Max	Std. dev
LDR	90,16	84,28	12,53	355,00	34,26
NPL	1,66	1,39	-0,61	9,92	1,39
CAR	31,37	24,11	10,52	283,84	27,21
ROA	0,62	0,82	-15,89	5,16	2,57

Source: data processing

The regression results of the research model using SPSS are displayed in Table 4. It can be seen that in model 1 the regression coefficients of all variables are significant, while in model 2 there are two variables that are not significant, namely the CAR variable and the interaction of NPL with LDR.

Table 4. Regression results

Variable	Model 1	Model 2
ZLDR	0,018 (0,00)***	0,607 (0,00)***
ZNPL	-0,453 (0,00)***	-0,699 (0,00)***
CAR	-0,019 (0,00)***	-0,246 (0,19)
zNPL-zLDR		0,063 (0,77)
zCAR-zLDR		-0,818 (0,00)***
F	10,64 (0,00)***	9,266 (0,00)***
R ²	0,327	0,386

Source: data processing

The results of statistical tests show that the regression coefficient for the LDR variable is positive. The higher the LDR indicates low liquidity, and vice versa, the lower the LDR indicates high liquidity. Thus, the test results show a negative relationship between liquidity and profitability. This negative relationship can be explained by the trade-off factor between liquidity and profitability. Banks with high liquidity have assets that are easier to liquidate, such as cash

and short-term securities. These assets earn lower interest rates than long-term assets such as credit. On the other hand, banks with high liquidity have higher funding costs because they have to offer more attractive interest rates to attract third party funds. The combination of low asset interest rates and high funding costs can put pressure on bank profitability. Banks with high liquidity tend to be more conservative in allocating their assets. They may prefer safe, liquid assets even though their returns are lower. This can lead to lower profitability compared to banks that are more aggressive in allocating their assets to high-risk assets with higher profit potential. Banks with high liquidity generally have higher operational costs because they have to maintain adequate levels of liquid assets. These fees may include cash storage fees, securities trading fees, and other liquid asset management fees. High operational costs can suppress bank profitability.

The regression coefficient for the NPL variable is negative. The higher the credit risk, the lower the bank's profitability. This relationship can be explained by several factors, such as a decrease in interest income, credit losses, a decrease in customer trust, and an increase in operational costs. When customers fail to pay their loans (default), the bank not only loses interest income but also increases collection costs and increases the allowance for losses to anticipate potential losses due to bad credit. If the customer fails to pay the loan, the bank may experience a loss on the principal of the loan. This can cause a decrease in the value of bank assets, so that bank capital is also reduced. If bank capital becomes too low, it will increase the risk of bank default. A high level of credit risk can reduce customer confidence. This increases the cost of acquiring new customers, as banks have to offer higher incentives to attract customers.

The regression coefficient for the CAR variable is negative. The finding that capital adequacy actually negatively impacts bank profitability is an unusual result and needs further investigation. Banks with high capital may be more careful in taking risks (Bitar et al., 2018). However, in this research it was found that the impact actually reduced profitability. Distribute credit to customers with lower risk, resulting in lower interest rates. Investing in safer assets, results in lower returns. In model 2 the negative effect of CAR is not significant, but the interaction with liquidity strengthens this negative effect.

The regression coefficient for the interaction variable NPL and LDR is not significant. This result is the same as the findings of (Dang, 2019b). This insignificant relationship is explained from the perspective of banking practices that focus on managing credit risk and liquidity risk separately but ignore the joint management framework.

The regression coefficient for the interaction variable CAR and LDR is significantly negative. The combination of high CAR and low LDR has a negative impact on profitability. Likewise with the combination of low CAR with high LDR. Banks with high capital adequacy and high liquidity indicate the bank's inability to manage funds in lending, thereby reducing profitability. Banks with low capital adequacy and low liquidity indicate that in distributing credit the bank uses expensive sources of funds, thereby reducing bank profitability.

4. Conclusions

Banking maintains liquidity, credit risk and capital adequacy in carrying out its operations. Credit distribution and additional capital from owners are related to bank liquidity. Based on this, this research studies how liquidity, credit risk and capital influence bank profitability. Liquidity and credit risk have a significant effect on profitability, but the interaction of these two variables does not have a significant effect on bank profitability. Liquidity has a negative effect on profitability, this means that a trade-off of liquidity and profitability occurs in Indonesian banking.

Credit risk has a negative impact on profitability because bad credit creates costs that reduce bank profits. The combination of loan to deposit ratio and capital has a negative effect on profitability. Banks with high credit distribution but not supported by strong capital will reduce profitability ratios. Vice versa, banks with high capital but low credit distribution also reduce profitability. This shows that the liquidity and profitability trade-off is stronger in banks with high capital.

There is a limitation in this research, namely that the liquidity measurement focuses on customer deposits and credit to customers. Suggestions for further research are to explore other sources of liquidity. The suggestion for management is to optimize the placement of funds to increase profitability. In addition, it is necessary to align liquidity management with credit management.

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