

Enhancing Risk Governance in Regional Development Banks: How Liquidity Risk Mediates the Credit Risk-Stability Relationship

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Paper Number: 240148

Abstract:

This study examines the extent to which credit risk affects bank stability, both directly and indirectly through liquidity risk. Current economic conditions have a significant impact on banking stability, including that of Regional Development Banks (BPD), which play a strategic role in supporting regional economic development. In recent years, BPDs have faced significant pressure due to the regional economic slowdown, increased credit risk in commodity-based sectors, and liquidity dynamics influenced by dependence on short-term third-party funds. The phenomenon of increasing NPL ratios in several BPDs, LDR fluctuations indicating liquidity pressure, and variations in profitability performance among BPDs indicate potential instability. This study investigates the effect of credit risk on BPD stability and assesses the role of liquidity risk as a mediating variable explaining the risk transmission mechanism. Referring to financial intermediation theory, which emphasizes that a bank's ability to manage its intermediation function is strongly influenced by profitability and liquidity adequacy. The novelty of this study lies in the use of liquidity risk as a mediating variable in the influence of credit risk on stability. Using a causal-comparative quantitative design, this study analyzes panel data from 21 regional development banks during the 2020–2024 period. Credit risk functions as an exogenous variable, liquidity risk operates as a mediating variable, and stability, assessed via Z-score and NIM, serves as an endogenous variable. This study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the direct and mediated paths, supported by bootstrapping to assess the significance of the indirect effect. Data are obtained from quarterly financial reports sourced from the Financial Services Authority (OJK), ensuring reliability, comparability, and representation over time. The results of the study indicate that credit risk has a significant negative effect on bank stability and a significant negative effect on profitability. Credit risk also has a significant positive effect on liquidity risk, indicating that increased credit risk contributes to bank funding pressures. Furthermore, liquidity risk has a significant negative effect on bank stability. This study also confirms that liquidity risk mediates the relationship between credit risk and stability. Overall, these findings confirm that prudent credit risk control and liquidity management are the main foundations of the stability of regional development banks.

Keywords: Credit Risk, Liquidity Risk, Stability.

Introduction

Banking stability is the primary foundation for the resilience of the national financial system because banks act as intermediary institutions that collect funds, distribute credit, and support real economic activity. Disruptions to bank stability can trigger systemic risk, a decline in public confidence, and even economic crises, as reflected in the 1997–1998 and 2008 financial crises (Allen & Wood, 2006). Banking stability is defined as the ability of the financial system to effectively carry out its intermediary function, maintain solvency, and withstand internal and external shocks (Cihak et al., 2012).

Banking stability is a fundamental prerequisite for creating a resilient financial system and a sustainable intermediation function. Banks play a crucial role in disbursing credit, managing public funds, and supporting economic activity across various sectors. For Indonesia, regional banking stability has a strategic dimension, given that Regional Development Banks (BPDs) function not only as intermediary institutions but also as partners with local governments in cash management and regional development financing. The unique role of BPDs results in different risk dynamics than national commercial banks. BPD performance is strongly influenced by regional economic characteristics, local government spending patterns, and the quality of their credit portfolios.

Credit risk is one of the main risks affecting bank stability because debtor failure to repay loans will increase Non-Performing Loans (NPLs), erode interest income, and increase the Allowance for Impairment Losses (CKPN). This condition has the potential to reduce capital and profitability, thus threatening stability (Berger & DeYoung, 1997). The potential for increased credit risk is one of the main challenges facing Regional Development Banks (BPD). Historical BPD data shows that the 2020–2024 period was marked by increased volatility in non-performing loans due to economic pressures from the pandemic, changes in regional spending structures, and weakening debtor repayment capacity. These conditions position credit risk as a variable that has the potential to significantly depress BPD stability.

Empirical studies on the effect of credit risk on stability show inconsistent findings. Some studies conclude that credit risk reduces stability (Nguyen Quoch Anh et al., 2021; Zhengmeng Chai et al., 2022), while other studies found a positive or insignificant effect (Zaghoudi, 2019; My Sang Tang et al., 2022). The inconsistent results suggest the potential presence of unaccounted-for mediating variables.

Liquidity risk is particularly relevant for regional banks (BPDs) because their funding structure is largely derived from local government funds, which are heavily influenced by the regional budget cycle. These fluctuations have the

potential to exacerbate the impact of credit risk on stability if not adequately managed. Therefore, liquidity risk has the potential to mediate the effect of credit risk on stability, as liquidity pressures can exacerbate the effects of non-performing loans.

This study is based on the theory of financial intermediation, which explains the role of banks in carrying out their intermediary function in the economy. Financial stability theory explains how to maintain a stable financial system so that the intermediation function continues despite shocks. This study comprehensively examines the relationship between credit risk and BPD stability, including liquidity risk as a mediating variable. Using the SEM-PLS approach and BPD panel data for the 2020–2024 period, this study is expected to provide significant empirical contributions and policy implications for strengthening BPD stability in Indonesia.

Literature review

2.1 Theoretical Framework

2.1.1 Financial Intermediation Theory

The theory of financial intermediation explains how financial institutions, especially banks, act as intermediaries between those with excess funds (savers) and those in need of funds (borrowers). In practice, the intermediation function is not merely channeling funds but also managing the risks inherent in carrying out this process. This theory asserts that financial institutions are pivotal in preserving market efficiency, facilitating seamless financial transactions, and ultimately ensuring the stability of the financial system as a whole. Banks that are effective in carrying out this intermediation function will have high profitability and a positive contribution to financial stability (Bhattacharya & Thakor, 1993).

2.1.2 Financial Stability Theory

Financial Stability Theory is a conceptual foundation that explains the conditions under which the financial system can absorb shocks, perform its intermediary function effectively, and support sustainable economic growth without creating systemic pressures that endanger the real economy. This theory posits that financial stability transcends the mere absence of crises; it encompasses the financial system's capacity to sustain its fundamental functions of fund allocation, risk management, and the facilitation of payments and transactions, even in adverse conditions (Schinasi, 2004).

2.1.3 Bank Stability

Bank stability reflects the absence of significant disruptions in the financial intermediation function and the absence of expectations of bank failure in the near future. In other words, stability is reflected in the bank's ability to remain solvent and liquid in the face of external and internal pressures (Čihák & Schaeck, 2010). In academic literature, stability is most commonly assessed using the Z score, an indicator that reflects risk-bearing capacity or resilience to financial risks. This indicator combines information on profitability, capital, and income volatility, thus providing a probabilistic measure of how likely a bank is to experience losses that could wipe out all of its capital. Another indicator used in measuring stability is an indicator that reflects income resilience, or the resilience of income in maintaining profitability using the NIM proxy. The measurement of stability using the Z-score and NIM indicators refers to the results of research by Beck et al. (2013), who found that banking stability depends not only on capital strength and risk control but also on the bank's ability to maintain sustainable income margins.

Bank stability consists of several components that form a bank stability framework where this framework not only reflects the bank's internal health but also includes resilience to external pressures and systemic risks. The components of bank stability include capital adequacy that functions as a buffer to absorb losses, liquidity adequacy, asset quality, profitability that reflects the bank's capacity to generate profits sustainably, governance and risk management, and systemic resilience. (Čihák & Schaeck, 2010)

Bank stability plays a key role in maintaining the sustainability of the financial intermediation function and public confidence in the banking system. Stable banks are able to distribute credit, manage third-party funds, and provide payment services efficiently despite facing risk pressures, thus supporting economic growth. If the banking sector is disrupted, the impact can spread to systemic risk, triggering a financial crisis, credit contraction, declining economic growth, and even a loss of public confidence in the financial system. Therefore, the failure of the banking sector not only causes a financial crisis but can also trigger a prolonged economic recession (Allen & Wood, 2006).

Suboptimal risk management practices, portfolio concentration, or reliance on market-sensitive funding sources can also create the illusion of stability, where banks appear robust but are actually vulnerable to sudden changes in the macroeconomic environment. This complexity has prompted researchers to examine stability not only through conventional indicators but also through fundamental factors that influence overall bank resilience. Regulators also closely monitor bank stability patterns, as fluctuations in

stability can signal emerging risk pressures, structural imbalances, or potential systemic vulnerabilities in the financial sector. Therefore, a deeper understanding of stability is crucial for assessing the long-term health of banks and maintaining the resilience of the financial system as a whole.

2.1.4 Credit Risk

Credit risk refers to the possibility that a debtor will fail to meet its principal or interest payment obligations as agreed. This risk arises from various lending activities, including retail, commercial, and corporate lending, as well as financing certain sectors that are highly sensitive to economic cycles. Strategically, credit risk is a core component of a bank's risk profile because credit quality significantly determines financial stability, capital adequacy, and the bank's ability to maintain profitability.

Credit risk is greatly influenced by asymmetric information, as explained in the Asymmetric Information Theory. This information imbalance makes it difficult for banks to accurately assess debtor risk, leaving them vulnerable to adverse selection and moral hazard, which can significantly worsen their credit portfolio (Akerlof, 1970).

A more diversified approach to credit portfolios allows banks to spread risk more evenly, reduce dependence on the performance of a particular segment, and increase overall resilience, but poorly managed credit diversification can create new challenges, especially when banks expand credit distribution to segments that are outside their core competencies.

Credit risk not only directly impacts stability but is also closely linked to liquidity risk. When non-performing loans increase, cash inflows weaken, making it difficult for banks to meet short-term obligations and potentially experiencing liquidity strain. This trend is in line with the Liquidity Strain Hypothesis (Vodová, 2011). This conclusion shows that credit risk does not stand alone but has a contagious effect on other risks, particularly liquidity and profitability.

2.1. 5 Liquidity Risk

Liquidity risk reflects a bank's inability to meet short-term obligations without disrupting operational stability. This risk arises from a mismatch in maturity between funds raised and assets disbursed. When managed well, liquidity serves as a "first line of defense" to withstand economic volatility, maintain depositor confidence, and enable banks to maintain their intermediary function despite market shocks. However, when not managed effectively, liquidity pressures can trigger *bank runs*, *asset fire sales*, and ultimately threaten solvency (Diamond & Dybvig, 1983).

Liquidity risk has several important consequences for bank performance and stability. First, indicators such as the Loan to Deposit Ratio (LDR) reflect reliance on short-term funding sources; an excessively high LDR indicates aggressive credit expansion, which increases the potential for liquidity pressures when funds are suddenly withdrawn (Vodová, 2011). Second, Liquid Assets to Total Assets (LATA) serves as a measure of a bank's flexibility in meeting urgent funding needs; a decrease in LATA indicates a weakening of liquidity reserves and an increase in the bank's liquidity risk. Third, adequate liquidity reduces the probability of asset *fire sales* and helps maintain bank stability, as Berger & Bouwman (2009) emphasized that banks with high liquid assets are better prepared to face market turmoil. Fourth, liquidity pressures have a systemic impact because declining liquidity is often an early indicator of financial instability before solvency problems arise (Laeven & Levine, 2009).

Despite the crucial role of liquidity, empirical findings indicate that managing it is not simple. Excessive diversification of liquidity sources or aggressive reliance on short-term funding can increase volatility, especially when market sentiment changes rapidly. The Liquidity Strain Hypothesis explains that increased credit risk directly worsens liquidity by reducing cash inflows and triggering a spiral of asset disposals during crises (Vodová, 2011). In developing financial systems, banks' limited ability to monitor, project, and manage liquidity positions often exacerbates liquidity stress. This issue is particularly relevant for banks with limited resources to develop complex liquidity management models.

2.1.6 Relationship between Credit Risk and Stability

The link between credit risk and banking stability shows how asset quality and the resilience of the financial system work together. Theoretically, increased credit risk, reflected in soaring Non-Performing Loans (NPLs), erodes interest income, increases the need for loss provisions, and puts pressure on bank capital, thereby undermining stability (Freixas & Rochet, 2008; Schinasi, 2004). Within the framework of *financial stability theory*, stability is achieved when banks are able to absorb shocks and maintain their intermediation function; however, high credit risk increases the chance of losses, reduces market confidence, and triggers potential systemic instability (Diamond & Rajan, 2005). From the perspective of *asymmetric information theory*, low information quality gives rise to *adverse selection* and *moral hazard*, thereby exacerbating credit risk and threatening the sustainability of intermediation (Stiglitz & Weiss, 1981). This mechanism explains why rising NPLs structurally increase bank vulnerability.

Credit risk reduces a bank's ability to absorb losses and increases the potential for insolvency, especially when credit stress occurs simultaneously with economic downturns (Minsky, 1992). This finding aligns with empirical studies that demonstrate consistency: the higher the credit risk, the lower the bank's stability, as found in banking in Vietnam (Nguyen Quoc Anh et al., 2021), Pakistan (Zhengmeng Chai et al., 2022), and Jordan (Sawsan Ismail et al., 2023).

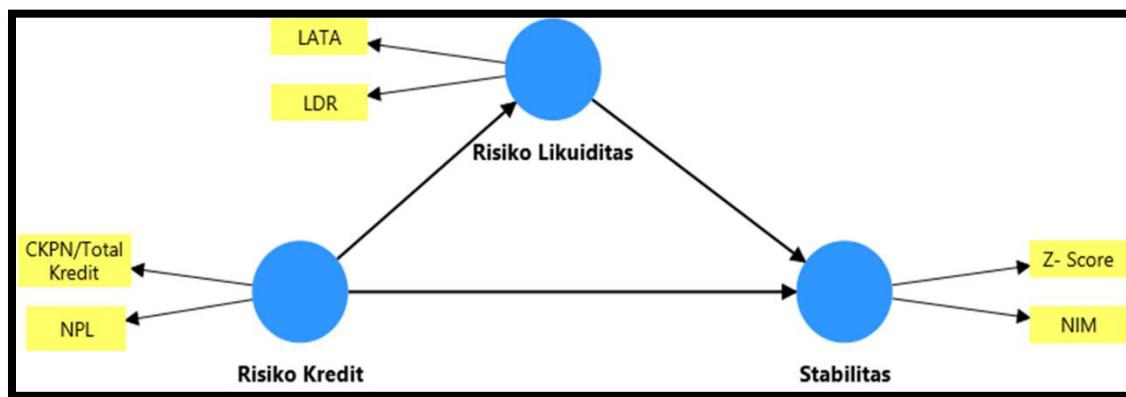
However, this relationship is not always linear; some studies suggest that liquidity risk can amplify the impact of credit risk on stability through liquidity spirals, when credit deterioration triggers liquidity pressures and worsens bank balance sheet conditions (Brunnermeier & Pedersen, 2009). In other words, these frameworks explain why empirical results across various financial systems demonstrate the complexity of the relationship between credit risk and stability.

Bank stability is highly sensitive to credit risk dynamics, a relationship that depends on the quality of risk management, capital adequacy, liquidity conditions, and the bank's ability to maintain profitability as a cushion against losses. This complexity also explains the diverse findings in the literature and the importance of managing credit risk as a foundation for financial stability.

2.2 Conceptual Framework

This research's conceptual framework is built on the intersection of Financial Intermediation Theory and Financial Stability Theory, which collectively explain how credit risk and liquidity risk influence the stability of banks. Within this framework, liquidity risk is positioned as a mediating mechanism that can amplify, channel, or modify the impact of credit risk on stability.

Figure 1: Conceptual Framework



Financial Intermediation Theory emphasizes that banks act as intermediaries, absorbing risk through the processes of debtor selection, monitoring, and risk transformation. As credit risk increases, asset quality declines and provisioning burdens increase, squeezing cash flows and weakening banks' capacity to maintain stability (Diamond, 1984; Bhattacharya & Thakor, 1993). Financial Stability Theory reinforces this logic by explaining that stability is achieved when the financial system is able to absorb shocks and maintain its intermediary function sustainably (Schinasi, 2004).

However, high credit risk can create liquidity pressure through the liquidity strain mechanism, namely when non-performing loans reduce cash inflows and narrow the bank's capacity to meet short-term obligations (Vodová, 2011). This condition places liquidity risk as a critical transmission channel in the relationship between credit risk and stability.

Hypothesis

- H1: Credit risk has a negative and significant impact on bank stability.
- H2: Credit Risk has a positive and significant influence on bank Liquidity Risk
- H3: Liquidity risk has a negative and significant impact on bank stability.
- H4: Liquidity Risk mediates the relationship between Credit Risk and bank stability.

Method

This study adopts a quantitative research approach with a causal-comparative design to examine how credit risk affects bank stability and the mediating role of liquidity risk in this relationship. This analysis uses panel data collected from Regional Development Banks (BPD) during the 2020–2024 period. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with Smart PLS 4.1.1.1.2 software. The analysis was conducted in two stages: evaluation of the measurement model (convergent validity, discriminant validity, and reliability) and the structural model (path coefficient R^2 , effect size, and predictive relevance). The mediating role of profitability and liquidity risk was tested using the bootstrapping method with 5,000 resamples (Hair et al., 2019).

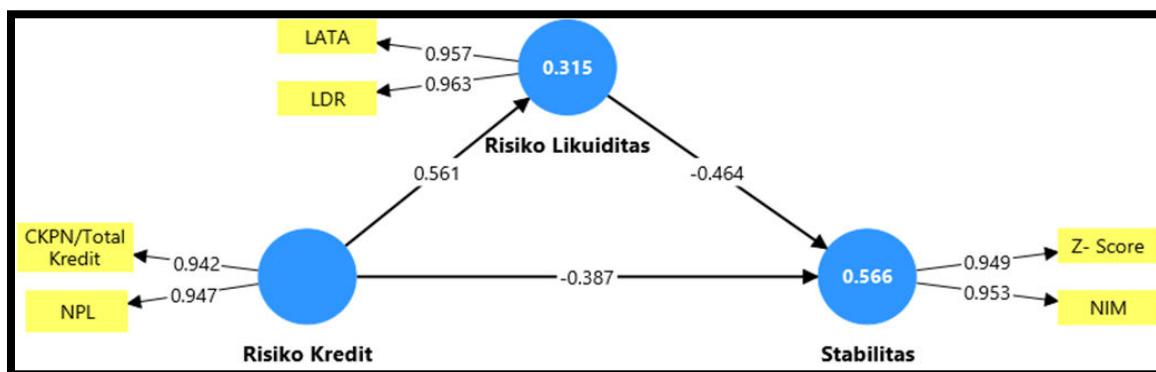
The study population consisted of 27 regional development banks (BPDs) registered with the Financial Services Authority (OJK). Using purposive sampling, 21 banks that met certain criteria, such as complete financial statements, reporting in rupiah, positive profitability, and BPDs falling into the KBMI 1 category, were selected as the final sample. This study operationalized three key constructs: credit risk as an exogenous variable, liquidity risk as a mediating variable, and stability as an endogenous variable.

Data are sourced from financial reports available on the official BPD website and supplemented by publications from the Financial Services Authority (OJK). The analysis procedure begins with descriptive statistics to assess data characteristics, followed by an evaluation of the measurement model to confirm validity and reliability and determine the significance of causal pathways, including the mediating effects of profitability and liquidity risk on the relationship between credit risk and stability.

Results

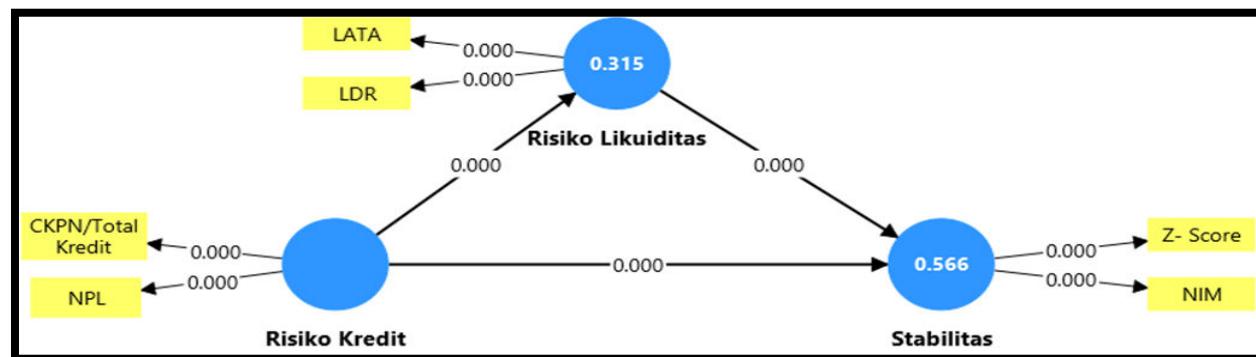
The measurement model was first evaluated to ensure construct validity and reliability. Figure 1 displays the outer model, which shows the outer loadings of each indicator on its latent construct. All indicators had loadings greater than the recommended threshold of 0.70, indicating that the items were valid in measuring their respective constructs. The outer model evaluation provided the basis for proceeding with the structural model analysis through a bootstrapping procedure.

Figure 1. Outer Loading Construct



After this stage, a structural model analysis was performed. Figure 2 illustrates the bootstrapping results with estimated path coefficients between latent constructs.

Figure 2. Bootstrapping Results



To provide more detailed information, Table 1 presents the complete path analysis results, including the original sample, standard deviation, t-statistics, and p-values.

Table 1: Path Analysis Results

Hypothesis	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
Credit Risk -> Stability	-0.387	-0.390	0.058	6,652	0.000
Credit Risk -> Liquidity Risk	0.561	0.559	0.053	10,551	0.000
Liquidity Risk -> Stability	-0.464	-0.461	0.060	7,695	0.000
Risk Credit -> Risk Liquidity -> Stability	-0.260	-0.256	0.028	9,234	0.000

Table 1 shows the results of path analysis using Smart PLS 4.0. The effect of credit risk on stability obtained an original sample value of -0.387 with a *t-statistic* of 6.652 and a *p-value* of 0.000. These results show a negative and significant effect at a level of 39%. The relationship between credit risk and liquidity risk is positive and significant with an original sample value of 0.561, a *t-statistic* of 10.551, and a *p-value* of 0.000, indicating a significance level of 56%. The relationship between liquidity risk and stability shows a significant negative effect with an original sample value of -0.464 with a *t-statistic* of 7.695 and a *p-value* of 0.000, indicating a significance level of 46%. The mediating effect of liquidity risk on the relationship between credit risk and stability shows an original sample value of -0.260 with a *t-statistic* of 9.234 and a *p-value* of 0.000. This value shows that credit risk plays a significant role in mediating the relationship between credit risk and stability.

Discussion:

This study examines the role of liquidity risk in mediating the effect of credit risk on stability. The research findings demonstrate an influence between the variables and confirm the hypotheses.

The direct effect of credit risk on stability was found to be significantly negative, indicating that high credit risk will increase the likelihood of bank losses, erode capital, reduce market confidence, and ultimately weaken financial system stability. This result contradicts previous research (Sang Tang

My et al., 2022), which found credit risk to have a significant positive effect on stability, but is consistent with research (Nguyen Quoc Anh et al., 2021), which found credit risk to have a negative impact on financial stability, thus highlighting the importance of effective credit risk management strategies for maintaining financial system stability.

Furthermore, the results of the study show that credit risk has a positive and significant effect on liquidity risk, this finding contradicts the study (Youssef Mohamed Riahi, 2018) which found that credit risk has a significant negative effect on liquidity risk, but is in line with the study (Margaret Rutendo Magwedere, Ph.D et al., 2022) which found that banks with high levels of non-performing loans may not fulfill depositors' withdrawal requests, which can reduce cash flow and trigger depreciation of loan assets, thereby increasing liquidity risk. As for the relationship between liquidity risk and stability, this study found that liquidity risk has a significant negative effect on stability. This finding is in line with the study (Dessi Ratna Sari et al., 2025), which found that liquidity risk has a significant negative effect on bank stability. This shows that lower liquidity risk tends to increase moral hazard and bank risk-taking.

The results of the mediation test found that liquidity risk can mediate the effect of credit risk on stability, this finding is in line with the results of research (Ni Luh Putu Budi Agustini et al., 2017) which found that liquidity acts as a partial mediator of the effect of capital adequacy on profitability, and liquidity acts as a partial mediator of the effect of credit risk on profitability.

In short, this study supports the idea that credit risk has a strong and statistically significant direct effect on bank stability, that high credit risk will increase the likelihood of bank losses, erode capital, reduce market confidence, and ultimately weaken the stability of the financial system. Credit risk shows a clear and significant indirect effect through liquidity risk, indicating that liquidity pressures originating from credit risk can exacerbate market conditions, causing asset price declines and weakening bank balance sheets, which ultimately lead to a stability crisis.

The strength of this study lies in its model, which integrates liquidity risk as a mediating variable within a single research model. This offers a deep understanding of the context of bank risk and stability, providing new insights for theory and practice.

However, this study has limitations. It treats the entire BPD sample as a homogeneous sample, without distinguishing the regional characteristics of each BPD, even though in reality, Regional Development Banks in Indonesia have varying levels of maturity. Furthermore, this study does not consider macroeconomic factors and governance.

Conclusion:

This study examines the influence of credit risk and liquidity risk on stability in Regional Development Banks in Indonesia, with particular emphasis on the mediating role of liquidity risk.

- 1) Credit Risk has a significant negative influence on stability; this confirms that credit risk can reduce bank stability.
- 2) Credit Risk has a significant positive influence on Liquidity Risk; this confirms that credit risk can increase bank liquidity risk.
- 3) Liquidity Risk has a significant negative impact on stability; this confirms that increasing liquidity risk will reduce bank stability.
- 4) Credit Risk has an influence on stability through Liquidity Risk, so it can be concluded that Liquidity Risk significantly plays a role as a variable that mediates the influence of Credit Risk towards Stability.

This study contributes theoretically by refining our understanding of how risk management affects bank profitability and stability and, practically, by offering ideas for strengthening BPD resilience to fiscal or macroeconomic shocks.

Practical Recommendations

Regional Development Bank (BPD) management should strengthen credit risk management, as credit risk is the root of various financial instabilities. Strengthening credit risk management includes improving credit analysis processes, implementing modern credit scoring, enhancing the quality of early warning systems, and diversifying credit into productive sectors. Such an effort is crucial given that the dominance of consumer credit for civil servants (ASN) makes BPDs vulnerable to concentration risk.

Regional Development Banks (BPD) need to be more aggressive in increasing efficiency through digitalization, reducing operational expenses, and developing non-interest income. This approach will improve financial performance and strengthen the bank's resilience to external shocks.

Regional Development Banks (BPD) must reduce their over-reliance on regional government funds by expanding long-term funding sources. Banks need to develop community funds, strengthen ALMA, and conduct liquidity stress tests to predict cash flow needs during periods of high withdrawals.

Future research

Future research is recommended to incorporate regional macroeconomic and fiscal variables that significantly influence banking risk performance, such as regional economic growth, inflation rates, or regional budget volatility. Furthermore, governance variables should be included as moderators or

mediators to capture the institutional dynamics that are unique to regional development banks. Future research should also consider the use of more comprehensive stability indicators, such as CoVaR, SRISK, or Basel-based liquidity indicators (LCR and NSFR), to more comprehensively assess bank stability.

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